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How Bullish are Silver's Prospects?

PRESIDENT Kennedy's instruction to the U.S. Treasury to suspend the sale of "free" silver means, in effect that silver, though doubtless it will continue to be used in coinage to a diminishing extent, will henceforth be treated as primarily an industrial metal, free to rise and fall in price in response to (subject to whatever control measures, if any, may in future be introduced by international agencies in the interests of market stability) supply and demand.

Since 1946, the U.S. Treasury has been obliged to buy newly-mined silver from producers at 90.5c. an ounce and make it available to domestic consumers from its "free" stock at 91c. per ounce delivered at the San Francisco Mint. This policy has effectively set a floor and a ceiling on world prices. During the past fifteen years the purchasing power of the dollar has persistently declined and the prices of most metals have doubled or trebled, but silver has fluctuated within these narrow limits. One consequence of this situation has been to make the extraction of silver on its own account an unprofitable proposition, except for a handful of producers, so that the bulk of the world supply has been derived as a by-product in the mining of base metals, notably lead and zinc. It is for this reason that world production has remained more or less consistently throughout the 'fifties in the region of 200,000,000 ounces a year. Since both zinc and lead are in oversupply and efforts are being made to cutback output of the latter, the supply of silver as a by-product metal is more likely to contract than expand in the immediate future.

World consumption, on the other hand, has risen very steeply in the past few years, amounting in 1960 to 319,000,000 ounces compared with 272,000,000 in 1956. This increase has been due in part to the growing demand from industry both for established uses and for the new and exciting applications which silver is finding in the electronics and missile fields. A second factor contributing to the growth in world demand has been the return to silver for currency purposes by a number of countries, especially in Europe, where paper money of small denominations has come to be regarded as the visible symbol of inflation. Last year France alone purchased 12,200,000 ounces of silver for this purpose, for which some 40,000,000 ounces are still required. Moreover, the United States has been taking silver to the extent of about $45,000,000 a year for its own currency needs.

The rising gap between supply and demand has been bridged by the progressively rapid depletion of the U.S. Treasury's free silver stock, of which only 124,000,000 ounces remained on January 1, 1961, as compared with 202,000,000 ounces at the beginning of 1959. As occurred in the case of the International Tin Agreement's buffer stock, exhaustion of the supply was hastened by stock building and to a lesser extent by speculative activity as the bottom of the barrel came into sight. By November 29, when President Kennedy stepped in, the free stock had shrunk to 26,679,316 ounces—equivalent at the existing rate of depletion to only a few days' supply.

As was to be expected, the President's action triggered off a further surge of speculative activity. The price of the metal itself rose to its highest level since 1920. It has since eased slightly and spot silver is currently in the region of 84¼-85¼d., which compares with 80d. as quoted in our issue of November 24. New York celebrated silver's return to freedom by hoisting the price by 9¾c. an ounce, at which level it was some 2c. above the London price. Previously New York had been some 2 to 3 cents lower than London. It is currently 100.75c. but, according to New York sources quoted in London by Samuel Montagu and Co., the bullion brokers, the price may gradually approach about 105 cents unless restrained by speculative re-selling from London, since a substantial amount of silver is apparently awaiting sale in New York at that price. Shares of mining companies deriving the whole or part of their income from silver were also marked higher.

In anticipation of the situation which has arisen, most users of silver have accumulated heavy stocks. Recent dealings in the metal have therefore been largely speculative, with buyers and sellers in broad equilibrium. The stability of silver prices at the higher level now prevailing has been further assisted by consideration of the U.S. Government's new proposals, which are by no means wholly bullish.

The encouragement which silver producers, and to a minor extent lead and zinc producers, must have derived from the prospect of a return to a free silver market, has been tempered by the official proposals for drawing America's coinage requirements from the gradual retirement of silver certificates instead of from the world market. The U.S. Government has nearly 500,000,000 ounces of silver which is at present backing the $5 and $10 silver certificates. Retirement of these certificates from circulation would be done over a period of eight to ten years and the silver so obtained would be used to meet the demand for five, 10, 25 and 50 cent coins. The release of a further 12,000,000 ounces backing the one-dollar silver certificates is similarly recommended, subject to the approval of Congress which can by no means be taken for granted.

The effect of these proposals will be to deprive silver producers for an indefinite period of a market for some 45,000,000 ounces a year, but even this large quantity represents less than half the annual deficiency which in each of the years 1959 and 1960 has exceeded 115,000,000 ounces. Moreover, the recovery of the U.S. economy will be accompanied by a revival in the domestic consumption of silver by the arts and industries, which fell by about 3 per cent in 1960, and might well be followed by a general improvement in Free World industry and trade. It is conceivable, too, that the demand for silver for coinage purposes by countries other than the United States will remain at a high and possibly rising level in the coming years, though this will depend largely on the future trend of silver prices.

On the other side of the equation is the existence of vast quantities of secondary metal, notably in the Far East, which could be expected to come on to the world market in progressively greater quantities as the price increased. China, in particular, with its urgent need for foreign exchange, could be expected to take advantage of a sellers' market to step up its exports of silver, while quite a small rise in price could make the melting down of silver coins a profitable operation for certain countries.

All in all, the liberation of silver seems to point to a higher level of prices than in the past decade. In view of the stabilising elements inherent in the silver market, however, the U.S. price seems likely to remain well below $1.29 an ounce, the point at which it becomes worth while for America's entire stock of silver coins to be melted down. On the other hand, it is perhaps not over-optimistic to anticipate that the price will rise sufficiently to give a much-needed impetus to output from the limited number of operations where silver is the only metal extracted, as well as benefiting by-product producers to a limited extent.

Over a long period, retirement of the silver certificates will reduce the U.S. free gold stock by about $150,000,000 for the $5 certificates and more than $500,000,000 if Congress allows complete retirement, since the Federal Reserve notes required to replace the certificates would require that much gold cover. Of much greater significance to gold producers, however, is the radical departure in U.S. Government policy represented by the decision to let silver find its own level, at last, after keeping it pegged for so many years at a figure which was becoming increasingly unrealistic. The breaching of the silver citadel gives added weight to the arguments put forward by the growing number of economists who believe that, sooner rather than later, in different though equally compelling circumstances, Washington may be forced to make a no less drastic change in its attitude to the price of gold.

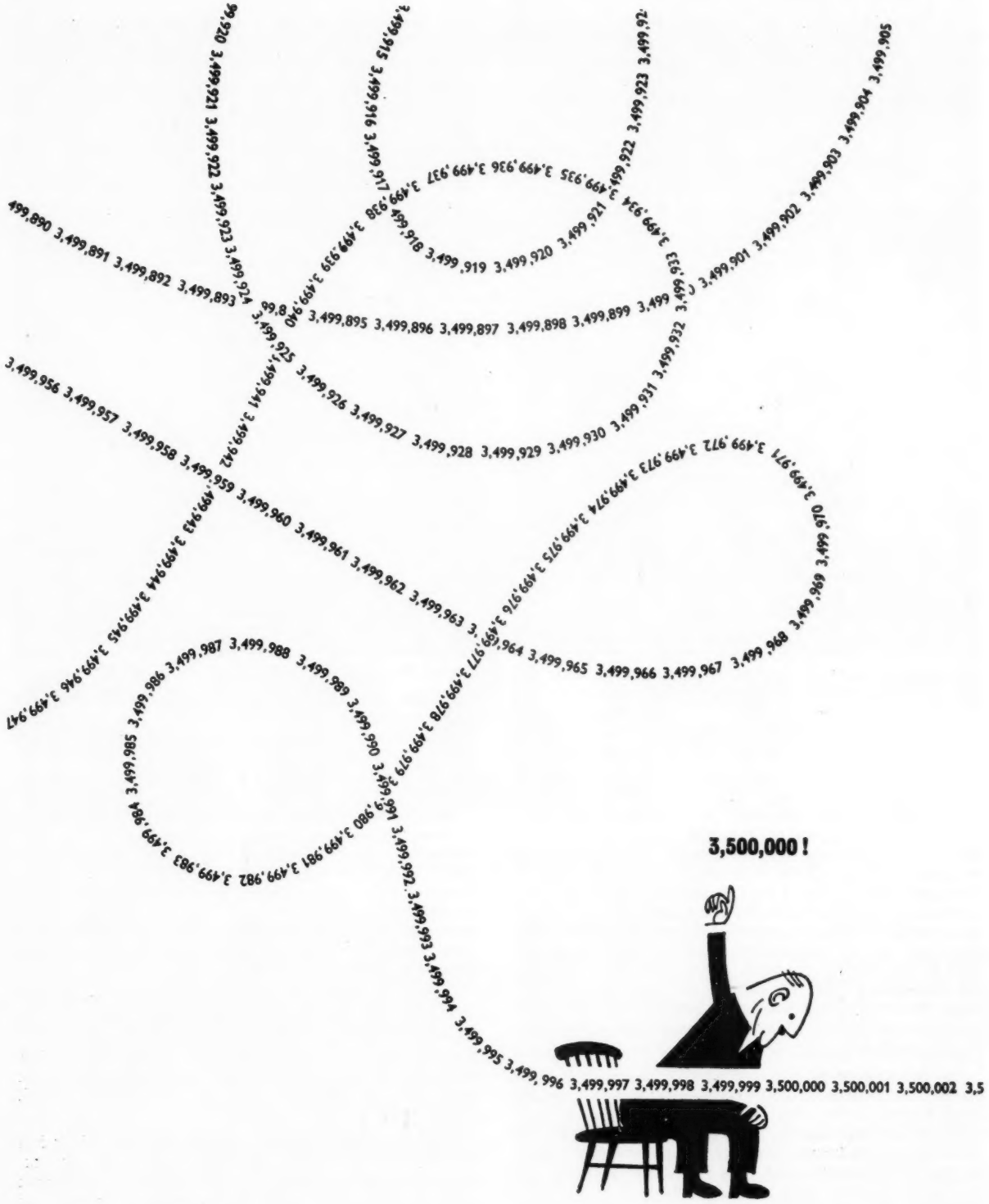
HOW FUEL CELLS MIGHT AFFECT MINING PRACTICE

The recent news that three leading British firms, British Ropes, British Petroleum and the G.K.N. group have joined with the state-sponsored National Research Development Corporation to form a new company to promote research into the development of fuel cells is indicative of the importance which industry now attaches to this novel means of power generation. The word novel is perhaps inappropriate in that the concept of using fuel cells emanated from Sir William Grove over a century ago although it is only within the last decade that the idea has really caught on.

Limited research into the development of fuel cells has gone on in Britain for a number of years, with the support of the N.R.D.C. The formation of this £200,000 consortium will speed this research and hasten the time when commercial fuel cells can be applied to industrial uses. For several years the N.R.D.C. has tried vainly to get industry interested in the potentialities of a commercial fuel cell but despite encouraging progress abroad the formation of this new company is the first really significant sign that British industry at large is awake to the possibilities. There is an immense market open to the country that gets in first with a satisfactory commercial fuel cell. Already some forty enterprises in the U.S. are working on their own version and experiments are being conducted also in Russia, West Germany, France and Sweden.

The first practical application of the fuel cell was demonstrated in 1957 by the U.S. Army Signal Corps and was strikingly successful. Continuous operation for one week of a mobile radar set required only 72 lbs. of fuel instead of an estimated 1,000 lbs. of conventional electric batteries. In the same year Allis-Chalmers Mfg. Co. demonstrated a cell driven tractor.

In mining, the compactness and high efficiency of the fuel cell would make its use an attractive proposition; particularly in the field of haulage. A fuel cell driven locomotive would have a much higher power/weight ratio than the normal battery driven vehicle and thus the range of this type of locomotive would be increased considerably. Currently, almost one-third of the total weight of a battery locomotive is taken up by costly batteries. Again there is the problem of maintaining adequate charging facilities underground and the necessity to provide spare batteries. Thus despite the undoubted advantages of the existing battery driven D.C. traction engine and the inherent mobility of battery vehicles, fairly tight limitations are placed on their field of application. The first cost and the possible life of



3½ MILLION FEET DRILLED WITH VICTOR DRILL STEELS ON HYDRO-ELECTRIC CONTRACT IN 12 MONTHS

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fuel cells are features which are as yet generally unknown. Even if the initial cost is greater than the normal battery, the fuel cell should still show an overall saving in that its life is virtually unlimited, since energy produced depends on an extraneous fuel supply and not on internal elements which deteriorate or are consumed.

Quite apart from portable fuel cells there are definite possibilities that banks of cells could meet large scale power requirements at mines or factories. Indeed, on the basis of potential efficiency advantages alone, its long-term prospects for replacing conventional power sources cannot be ruled out. Theoretically the fuel cell is capable of achieving almost 100 per cent efficiency and in demonstration models efficiencies of up to 80 per cent have already been recorded. By comparison, the overall efficiency of a coal or oil fired power station seldom exceeds 35 per cent.

Another fruitful application of the fuel cell would be in the storing of off-peak conventionally-produced electricity, so balancing the load on the power station. Electricity not needed at slack periods could be utilised to make fuel for the cells such as hydrogen and oxygen. These fuels would be consumed in the cells during peak periods to supplement normal power supplies. This load balancing is of particular importance at mines producing their own power and where the demand is often concentrated into one or two shifts.

Although crystal ball forecasting is always dangerous, and formidable economic and technical problems remain, the future for the fuel cell seems rather less nebulous than a few years ago. This future is of direct interest to many in the mining and metallurgical industries. Large scale power from fuel cells could find an application in electro-chemical processes requiring large quantities of low voltage D.C. such as in the production of aluminium. A swing to fuel cells could result in the loss of a valuable lead market.

The coal industry, too, has an obvious interest in the fuel cell and its future. Whatever this future may be it is refreshing to see that British industry is going to have some part in shaping it.

THE ABORTIVE STRIKE AT MT. ISA

After a stoppage of eight weeks, the men at Mount Isa have returned to work. The trouble arose through the demand by the unions for an increase in the bonus of £A8 per week. The A.W.U. (Australian Workers Union) demanded a bonus of £A25 per week, and the craft unions a bonus of £A26 4s. per week, but both demands were refused by the company. To clarify the situation, bonus provisions had been removed from the Arbitration Act some time ago and were therefore matters for negotiation between the parties concerned. To enforce their demands the unions resorted to bans on overtime and on contract work, causing serious restriction of production. A stoppage of four hours was then ordered by the unions, who were warned that such action would mean the closing of the works. As the meeting was held, the mine was immediately closed down until such time as the men returned to work with an assurance given by the unions that they would abide by the terms of their awards and the direction of the Queensland Industrial Court.

The unions claimed that the company's action constituted a lock-out, but the Industrial Commissioner ruled that there was no lock-out and ordered the men back to work. The order was obeyed by the A.W.U. but was ignored by the craft unions. A request for unemployment relief payment was refused by the Queensland Government on the grounds that the men were engaged in an industrial dispute. The government declared a state of emergency and ordered the strikers back to work, with the result that operations were resumed immediately.

It is stated that the stoppage caused a loss of £5,000,000 to the State, and £750,000 to the government itself, in loss of revenues and royalties. Loss in wages to the men is estimated at about £1,000,000. Nothing was gained by the unions, for the company refused to increase the bonus, which remains at £A8 per week. It is stated that 95 per cent of Mt. Isa employees received more than £A26 per week in the year ended June 30, 1961, and during that period the company paid out a total of £17,700,000 in bonuses. In the same period the company also spent £6,000,000 on power, roads, water supply, sewerage and recreational facilities for employees.

EXPORT OF KNOW-HOW AS SAFEGUARD FOR U.K. MINERAL SUPPLIES

Professor M. G. Fleming, giving his inaugural lecture as Professor of Mineral Technology at the Royal School of Mines this week presented a survey covering a very wide range from pre-historic times to the modern day and from the ancient base metals to the metals which we now commonly associate with this nuclear age.

In tracing the history of mineral technology from being a practical art to an applied science, Professor Fleming pointed to the outstanding achievements of the 20th century and to the fact that more minerals have been consumed during the past 60 years than in the total period of man's previous history. It was probably this fact, more than any other, that led to the rapid development of mineral processing technology, for the richer ore deposits had long since been exhausted and more and more we were being forced to look for our minerals in the lean and/or complex deposits that were valueless in the past.

At the time when the mineral dressing course was established at the Royal School of Mines, it was the only one of its kind in the Commonwealth and was one of the first in the world. While, from the standpoint of research and training it may be said that Britain is retaining her leading position in the field of mineral processing, Professor Fleming questioned whether, in the wider industrial sense this was so. As an industrial nation, Britain has been very dependent upon mineral resources, and as native production, excluding coal but including both metallic and non-metallic minerals, has provided only some 17 per cent of her requirements, Britain has been dependent upon imports. With the recent independence of many colonial territories, Britain's control over the mineral resources on which she depends has waned considerably and with the growth of "aid with strings" that followed the war, many of the emergent nations have come to look elsewhere than Britain for advice and equipment.

These developments have led to the British manufacturer's influence in mineral processing overseas now being nowhere as strong as it could or should be. The British Mining Equipment Export Association, the Professor said, showed great promise, but the goodwill that could be built up by the manufacturer could not, by itself, in any way ensure the pre-emption for Britain of her future mineral requirements. To ensure this, he continued, it was essential that aid should be given to new countries in the form of mining and metallurgical advice and equipment.

Government action was required and it was essential that a central body should be formed in Britain which would command the respect of both industry and government. The field of operations of this body would be the world, where it would be continually examining, reporting, advising and guiding.

FUTURE OF MINING IN INDIA

This article by R. K. Sinha, Indian Bureau of Mines, Nazpor, is reproduced from "The Eastern Metals Review", and has been abridged

HISTORY reveals that India in the past was one of the leading producers of diamond, gold, copper, lead, zinc and steel. Till 1886, the entire diamond wealth of the world had its origin in India. Panna in Madhya Pradesh and Golkonda in Andhra Pradesh were famous as diamond mining and gem cutting centres and supplied some of the most precious diamonds to the world.

Authentic records of mineral production go back to the early part of the 19th century when coal was the only mineral produced. Later by 1906, fourteen more minerals were added to the list and now the country is producing over 40 minerals. During 1948 India produced minerals valued at Rs. 64 crores, excluding petroleum and atomic minerals.

Trend after Independence

The value of mineral production has shown a steady rise after independence, increasing by Rs. 96 crores and Rs. 75 crores over 1948 and 1951 production figures respectively, excluding value of minerals prescribed under the Atomic Energy Act and petroleum. The past years have not only seen a considerable increase in the volume of minerals produced but also in the varieties of minerals mined. The tempo of progress is likely to be maintained during the current and successive Plan periods. By the end of the Third Plan period, the value of mineral production is expected to reach over Rs. 320 crores, just double the 1960 figure. The major contributing factor to the increase of production will be three-fold increases in production of iron ore, bauxite, magnesite, fireclay, limestone, and over one and half times increase in coal from the present level of production. The production of lead, zinc and silver will also be doubled. There will be a marked increase in the production of apatite, asbestos, barytes, chromite, china-clay, and pyrites etc.

The need to step up production consideraby is necessitated by the urgency of providing the requisite supply of minerals and ores to large scale plants set up and being set up in the country. The momentum of industrialization generated during the first and second Five-year Plan periods will be greatly accelerated during the Third Plan. Minerals are the sheet anchor of industrial development. In the coming years there will be tremendous expansion in the country in the production of iron and steel, aluminium, copper, lead, zinc, refractory materials, glass and ceramics, and chemicals. All these developments will require supplies of raw materials of specified quality and also in large quantities.

In the context of rapidly changing circumstances, we have to adopt a new outlook in granting new leases and in consolidating smaller units. Such steps should be spontaneous and initiative should come from mine-owners themselves, otherwise it is feared they would not be able to compete with the cost of production of the large scale mechanized mines being opened now.

Mechanization and Opening up of Mines

It has been indicated earlier that big plants require uninterrupted supply of requisite quality raw-material in bulk and it is difficult for smaller units to supply and sustain the bulk demands. In India mines are mostly worked by manual labour and deployment of mining machinery is limited to the individual owner's capacity to invest. Deployment of efficient mining machinery has now become essential.

Right steps have been taken in the opening of about seven coal mines by National Coal Development Corporation, each having 1,000,000 tonnes initial production capacity. The iron ore mines at Barasua, Punposh gorge in Orissa, Noamundi in Bihar, and Dhalli-Rajhara in Madhya Pradesh, Kemmangundi in Mysore, are also planned for mining over 1 000,000 tonnes of iron ore annually. The Kiriburu iron ore deposits in Bihar—Orissa proved by Indian Bureau of Mines and the Bailadila iron ore deposits in Madhya Pradesh being prospected by the Indian Bureau of Mines, are being planned to mine 2,000,000 to 5,000,000 tonnes of iron ore annually. The trend indicates that in future all mines will be of large size.

Equally important will be a rapid survey of the mineral deposits, blocking out suitable areas for opening up new mines, carrying out extensive exploratory works wherever the situation warrants, and intensifying the search of those minerals in which India is deficient. Detailed prospecting and proving of a number of prospects like coal, copper, iron ore, magnesite, sulphur, limestone and dolomite have been undertaken by the Indian Bureau of Mines, but these efforts are required to be expanded considerably by the Bureau of Mines and other organizations such as the Geological Survey of India, Department of Atomic Energy, National Mineral Development Corporation, National Coal Development Corporation and also by the State Government Directorates of Mining and Geology.

It is very necessary to have a thorough knowledge of the mineral potential in order to plan and develop new industries. For example, during the end of the Third Five Year Plan the iron and steel industry alone will require 50,000,000 tonnes of raw materials such as iron ore, coal, limestone, dolomite, chromite, magnesite etc. which will have to be hauled every year and also sufficient reserves of different minerals will have to be proved. For this work alone innumerable geologists and drilling engineers will be required apart from the numerous mining engineers, electrical engineers, mechanical engineers, ore dressing engineers and metallurgists who will also be required.

Shortage of Mining Machinery

Temporary shortages in supply of mining personnel may cause a setback in the development programme but more hindrance will be felt due to shortage of indigenous supply of mining machinery. At present the supply position of mining machinery is very acute. It would be a disaster for the future growth of mining activities if some concrete steps were not taken to manufacture mining machinery and other specialized equipment in time to meet the requirements of spare parts for replacement as well as entire equipments for opening new mines. Circumstances are favourable to set up a chain of mining manufacturing units in the country, as during the course of the last 14 years we have acquired sufficient knowledge regarding the type of machinery required. Machinery that would be required for daily use comprises earth moving equipments such as shovels, dozers, tractor shovels, scrapers, belt conveyors, steel wire ropes, dumpers, hoists, exhaust fans, pneumatic tools, such as air compressers and rock drills, drill rods, T.C. tipped bits, diamond bits, specialized equipments for coal mining and a host of other items. Some other machinery such as drills, oil well drilling rigs for explora-

tion purposes, diesel and electric mining cars will be also required. A modest beginning in these directions has been made. A plant to manufacture coal mining equipment is being set up at Durgapur. The heavy machine building plant at Hatia will manufacture excavator and oil well drilling rigs. Some private firms such as Voltas, C.P. Tools, Kilburn, Khosla and Co. have started manufacturing air compressors, rock drills, drill rods, diamond drills and single drum air hoists, resetting of diamond bits etc., yet there is a wide range of mining machinery and equipment which still requires to be manufactured in India. The Indian Bureau of Mines now manufactures for its own use in its works located at Nagpur tungsten carbide bits for drilling purposes. The entire requirements of T.C. bits for the Bureau are turned out from this works.

Self-Sufficiency

In the coming years our aim is to attain self-sufficiency in our requirements of various minerals and metals as early as possible. During the Third Five Year Plan the production targets of some of the metals and minerals have been laid down as follows :

(1)	Copper	18,400 tonnes
(2)	Aluminium	83,000 tonnes
(3)	Ferro-silicon	40,000 tonnes
(4)	Ferro-manganese	over 200,000 tonnes
(5)	Lead	8,000 tonnes
(6)	Zinc	15,000 tonnes
(7)	Iron and Steel	10,200,000 tonnes
(8)	Iron Ore	32,000,000 tonnes
(9)	Coal	97,000,000 tonnes
(10)	Limestone	30,000,000 tonnes

There will be a corresponding increase in the production of a number of other minerals.

The foregoing targets are to be achieved against the present production of 8,000 tonnes of copper; 8,000 tonnes of aluminium; 7,000 tonnes of ferro-silicon; 86,000 tonnes of ferro-manganese; 4,000 tonnes of lead; about 2,200,000 tonnes of steel; 10,600,000 tonnes of iron ore; 52,600,000 tonnes of coal and 13,000,000 tonnes of limestone. These targets can only be achieved by careful planning and lay out of the mines.

The increase in production targets will place us in a happy position regarding most of our requirements, but the position regarding non-ferrous metals except aluminium will continue to be depressing. The increase in production of copper, lead and zinc metals will still leave a wide gulf between production and demand. The increased production will not meet even one fifth of the present rate of consumption.

There seems to be no sign of this gulf narrowing in the foreseeable future. The net results of imports and exports of minerals and metals are placing India in imbalance of Rs. 100 crores every year, excluding imports of petroleum and petroleum products valued at Rs. 85 crores yearly. During 1960, India imported minerals and metals and alloys of the value of Rs. 10 crores and Rs. 158 crores, respectively, against the export of Rs. 51 crores and Rs. 14 crores, the deficit being thus Rs. 103 crores. The main cause of this imbalance is larger imports of iron and steel materials which alone cost well over hundred crores of rupees each year.

No country in the world is self-sufficient in all her requirements. Deficiency in one commodity is compensated for by surplus in another. We can get rid of this deficiency by increasing the production of iron and steel for which India is happily placed and by manufacturing various equipment and machinery required by industries. These is also good scope for the production and export of aluminium metal. It is expected that by the end of Third Plan, India may overtake Japan, which is at present the leading country in aluminium production in Asia. The average annual production in Japan is one lakh tons. In India licences have until now been granted to the capacity of 83,100 tonnes but plans are already ahead to increase production considerably. Hindustan Aluminium Corporation is considering the expansion of its capacity to 50,000 tonnes a year. A new company, Bharat Reynolds Aluminium Company will be setting up a plant at Karwar in Mysore, and will have 30,000 tonnes capacity with provisions for expansion to 90,000 tonnes a year.

Beneficiation and Utilization of Fines

Modern and advancing ore dressing technology has made it possible to utilize those ores or minerals which were regarded as waste till yesterday. This has revolutionized the mineral industry and added consideraby to the world's reserves of minerals. In India we have begun to think in these directions, but more vigorous efforts are still needed. There are only two manganese ore beneficiation plants in the country, these being worked by Central Provinces Manganese Ore Co., Nagpur, and Shivrajpur Syndicate, Panchmahal. A third manganese ore beneficiation plant is being set up at Garivadi by Sri Ram Durga Prasad. Associated Cement Co., have established three limestone beneficiation plants located at Jhinkpani and Khalari in Bihar and Sevalia in Gujarat. Prominence is also being given to the setting up of coal washeries, refining and processing plants for china-clay and ochres. Very soon we should think of beneficiation of iron ore, copper ore, lead-zinc-copper ores, chromite, magnesite and gypsum.

India has large deposits of high grade iron ores but the question of beneficiation has not been given much thought; it is thought uneconomical at present to treat upgraded iron ore for the steel industry. But we must revise our opinion soon, for it is not possible to go on discarding low grade ores.

By the end of the Third Plan when 32,000,000 tonnes are expected to be mined every year, nearly 10,000,000-15,000,000 tonnes will result as fines, and unless these are utilized every year the country will lose Rs. 4 to 6 crores annually. Tata Iron and Steel Company has set up a sintering plant at Jamshedpur. There is also provision at Barasua mines of Hindusthan Steel Ltd., to sinter fines resulting during the course of mining. Indian Bureau of Mines and National Metallurgical Laboratory are both experimenting on processes of sintering, agglomerating, and pelletizing various iron ore fines in India. We have reached a stage where utilization of fines and low grade ores have become a dire necessity.

INDIA'S IRON ORE DEPOSITS

Further particulars relating to the iron ore deposits of India were contained in the latest despatch received from our correspondent

IN the context of India's target of 10,000,000 tons of steel by 1965-66, her iron ore resources acquire significance. The Third Plan has a target of production of 32,000,000 tons of iron-ore. The requirements of ore for steel and pig-iron production are estimated at about 22,000,000 tons. The iron-ore required for export to Japan will amount to about 8,000,000 tons. Allowing about 2,000,000 tons for exports to other countries, the total requirements for export would be of the order of 10,000,000 tons. India's iron-ore reserves are estimated at about 21,000,000,000 tons, of which nearly 6,000,000,000 tons may be considered to be proved.

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The iron-ores of India are broadly made up of four general types. By far the most important are the hematites, which are usually found in very large deposits in Bihar, Orissa, Madhya Pradesh, Maharashtra and Mysore.

The major deposits, most of which are also the richest occurrences in India, exist in the Singhbhum and Bonai regions in Bihar and Orissa respectively, the Bailadila, Rowghat deposits of Bastar, and the Dhalli-Rajhara Kondekasa deposits of Durg district in Madhya Pradesh. Regional works have become the basis of the estimation of these reserves. Detailed investigations carried out indicate that reserves in some of the previous deposits have considerably exceeded the estimates that hitherto have been presented.

The Geological Survey of India is engaged in carrying out a detailed survey of the Bailadila deposit. After the completion of this investigation, it will be possible to reassess the total reserves of these known deposits, including some new ones located in the course of the survey. The two private sector steel plants, namely, those of Tata at Jamshedpur and Indian Iron and Steel at Burnpur, draw their iron-ore from the deposits in the Singhbhum area. Jamshedpur also draws a part of its iron-ore requirements from the three other mines located in the Gorumahisani, Sulaipet, and Badampahar areas of Mayurbhanj district in Orissa.

Major Metals In The Next Forty Years

Supply and demand prospects for six major tonnage metals up to the year 2,000 are analysed by Bruce C. Netschert and Hans H. Landsberg in "The Future Supply of the Major Metals", a reconnaissance survey published by Resources for the Future, Inc. The main conclusions regarding iron and manganese were summarised in our previous issue. In this concluding article the metals considered are aluminium, copper, lead and zinc

CONSIDERING aluminium, the most recent authoritative estimate of U.S. domestic bauxite reserves is 50,000,000 l. tons of ore in place (equivalent to 42,500,000 l. tons) as of December, 1958. This ore averages 53 per cent alumina and 10 per cent silica and contains 13,000,000 s. tons of aluminium.

Potential ores fall into three categories: (*a*) potential bauxite ores with less rigid criteria than those which currently define reserves; (*b*) bauxitic and high-alumina clays, and (*c*) non-bauxitic sources with comparatively high alumina content. With less restrictive criteria on bauxite ore (min. thickness 5 ft., min. alumina content 40 per cent, max. silica content 15 per cent, and no restriction on iron content), U.S. potential low-grade bauxite ore totals 88,900,000 l. tons of ore in place, containing 25,000,000 s. tons of alumina. In the second category the percentage of contained alumina declines towards 30 per cent, at which level there exists more than 1,000,000,000 tons. The third category includes such minerals and rocks as alunite, anorthosite, leucite and nepheline syenite. A chart in the report of the President's Materials Policy Commission (PMPC) shows the aluminium content of anorthosite resources at more than 1,000,000,000 tons and alunite resources at some 5,500,000 tons.

As in the case of manganese, the United States is basically a "have-not" nation for aluminium. Identified resources are much larger, however, and if they could become reserves they could meet projected requirements well into the next century. In the absence of such a development domestic production from current reserves can be expected to supply a continually decreasing portion of total U.S. needs.

Currently estimated world reserves of aluminium total some 825,000,000 l. tons, excluding certain additional suggested reserves such as those in Australia*. Total identified bauxite and bauxitic resources contain some 3,000,000,000 tons of aluminium, again with an additional unknown quantity. In discussing these figures, Netschert and Landsberg point out that only in the past few years has there been any real search for bauxite in Africa and Australia, while it is probable that the countries of southern Asia contain unrecorded deposits on a scale comparable to those of Africa and S. America, if not those of the Caribbean and Australia.

The growth in total world primary consumption in the period 1955-59 was 6.9 per cent, at which rate consumption between 1959 and 2,000 would total 940,000,000 tons. A still higher growth rate of 11.7 per cent was exhibited between 1950 and 1959, at which rate cumulative consumption would amount to 3,500,000,000 tons.

The continuation of a growth rate of 10 per cent or more over the coming forty years is regarded as most unlikely. Well before the end of the period the required annual capacity would call for fantastic levels of capital investment and electricity input and would imply continued large competitive inroads by aluminium on other metal consumption. A continuation of the current growth rate is also unlikely as aluminium becomes a "mature" metal, but it cannot be dismissed as easily because of the large opportunities that could still be opened up in both industrialised and underdeveloped countries.

Severe depletion of current world aluminium reserves by the end of the century can therefore be considered probable. Future additions to reserves (as currently defined) may or may not be adequate, and it is distinctly possible that in some areas it may be necessary to have recourse to low-grade bauxite and high alumina clays. This does not necessarily mean a higher cost for aluminium in the long-term future, having regard to the technological advances that may be expected to occur. If the cost of aluminium should rise significantly, the increase would probably be due to higher cost of electricity for aluminium processing, as the aluminium industry competes for the remaining low-cost hydropower in a world of rapidly mounting *per capita* energy demand.

Copper—Enough in Sight

The most recent authoritative estimate places U.S. copper reserves at 32,500,000 s. tons of metal contained in ore, the overall average grade being 0.9 per cent copper. This figure, however, covers only the working reserves of the mining companies. An estimate of 50,000,000 tons for the complete reserve figure is probably minimal. As regards potential ore, large tonnages are known to contain from 0.25 to 0.5 per cent copper, while there are areas of low-grade copper-bearing rock that have been only partly explored. In an attempt to estimate the quantity of potential ore associated with current reserves, a leading geologist, S. G. Lasky, has deduced a generalised mathematical relationship between grade of ore (or potential ore) and tonnage of contained metal. An application of the Lasky relationship appears in a generalised curve prepared for the PMPC by the U.S. Geological Survey and Bureau of Mines, which indicates a content of 100,000,000

*Indicated reserves of Australian bauxite exceeded 1,115,000,000 tons at the end of 1960—*Ed. M.J.*

IT'S A BETTER PROSPECT WITH JOY CORE DRILLS

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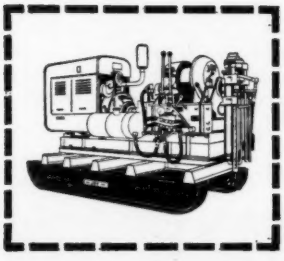

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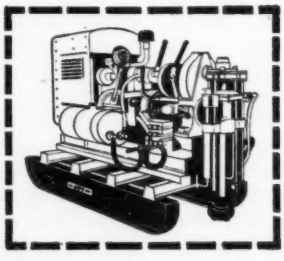

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tons of copper in material averaging 0.5 per cent copper.

The present study indicates that even resources of 100,000,000 tons would be insufficient to meet U.S. domestic requirements well before the end of the century. In fact, however, current production is not now meeting total domestic requirements, nor has it done so for some time.

Future discovery should justify an assumed U.S. capacity of 1,250,000 tons annually for the rest of the century, but it is significant that additions to reserves have come about in this century as much through the progressive use of the leaner portions of known copper mineralisations as through the discovery of new districts. This does not necessarily indicate that the limits of copper occurrence in the United States at a concentration level of current commercial significance have been thoroughly probed.

In countries outside the U.S. copper reserves, including the inferred category, can safely be stated to total at least 200,000,000 s. tons. In contrast to the average grade of less than 1 per cent in the United States, reserves are between 1 and 2 per cent in Canada and Chile, almost 4 per cent in Northern Rhodesia, and an average of 6 per cent in the Congo. A generalised grade-tonnage curve in the PMPC report indicates that, outside the United States, resources down to 1 per cent copper content total between 400,000,000 and 500,000,000 tons of copper, and down to 0.5 per cent or rather less, 1,000,000,000 tons. Moreover, the possibility of further important discoveries of deposits in the range of several per cent copper content should not be ruled out.

If world demand continues to grow at the rate of 5 per cent, as it did between 1950 and 1960, cumulative consumption will reach 551,000,000 tons annually by the year 2,000. At the growth rate of 3.9 per cent, which prevailed between 1955 and 1960, it would amount to 423,000,000 tons. Continuation of either of these rates over the next 40 years would require either additions to present reserves or recourse to presently potential ore.

The more modest growth rate of 1955-60, however, may be larger than that which will prevail over the next 40 years, in which connection it is pointed out that in the United States, primary copper consumption during the 1950's suffered an absolute decline of almost 20 per cent, more than half of which occurred in the latter half of the period. This decline may be attributed chiefly to the expansion of secondary supply and to the competitive inroads of aluminium.

As the most advanced industrial country, the United States in many ways shows in its recent statistical record the pattern of things to come in the rest of the world. In this instance, the U.S. experience does not call for the conclusion that world consumption of primary copper will undergo an absolute decline by the end of the century, but it does suggest that growth is likely to be slower in the future than it has recently been. Anything between zero growth and the 1955-60 rate would call for comparatively small additions to present reserves through to the end of the century. If, however, it became necessary to turn to potential ore, technological progress would in all probability allow this to be achieved with little, if any, increase in cost, bearing in mind that in the United States a reduction in grade of almost 75 per cent was accomplished over the past eight decades with no effect on cost.

Lead and Zinc Growth Rates Inadequate

The current official estimate of U.S. lead reserves is 2,900,000 s. tons in the measured and indicated categories, plus about 2,700,000 tons inferred. Of the total of 5,600,000 tons, between 70 and 80 per cent is considered recoverable with current technology at present prices.

Although lead is produced as a co-product or by-product from ore with less than 1 per cent lead content, the U.S. Geological Survey and Bureau of Mines in their report to the PMPC noted that identified potential lead ore might carry as much as 7 per cent lead. The reason for this disparity is that the value of the other metals and minerals present in a deposit is more important as a cost determinant than the percentage of lead alone. The U.S. Geological Survey and Bureau of Mines also noted that the total lead content of identified potential ore was no greater than the reserve figure at that time, or some 8,000,000 tons. For each of the metals previously considered in the survey, identified potential ore is at least several times the reserve level. This anomaly is of crucial significance in assessing the future supply position of lead.

The authors of the survey conclude that discoveries of many new districts, not merely extensions of measured and indicated reserves in known districts, would be required if annual U.S. domestic mine production were to do no more than hold the average of the past five years (roughly 300,000 s. tons) during the remainder of the century. Domestic self-sufficiency in the future would appear to be beyond any conceivable possibility.

Outside the United States, world lead reserves in the measured and indicated categories only are given as 45,900,000 s. tons, a figure which is certainly minimal. Inferred reserves might be two or three times as much as the other two categories combined, while so far as is known, there are no world estimates of potential ore.

Barring unforeseen developments in the demand pattern for primary lead, it is considered probable that the growth rate in world demand through the remainder of the century will be closer to 139,000,000 tons than 176,000,000 tons, these figures being based on average growth rates of 1.6 and 2.7, such as occurred in 1955-60 and 1950-60 respectively. Even if there were no growth in demand at all, however, it is apparent that large discoveries of lead are needed.

In 1957, the Bureau of Mines estimated measured and indicated reserves of zinc in the United States to be 13,485,000 s. tons of metal in ore, of which between 70 and 80 per cent was currently recoverable. Inferred reserves are judged to be at least equal to the sum of measured and indicated reserves. The PMPC report carries a statement by the U.S. Geological Survey and Bureau of Mines that "conceivably there may be present 20,000,000 tons of zinc in submarginal deposits".

The PMPC report projected U.S. zinc production on a plateau between 600,000 and 700,000 tons through 1975 and Lasky concluded that it should average between 625,000 and 675,000 tons over the same period. In view of the past discovery record these levels may be feasible. In addition, zinc appears to be more abundant than lead in U.S. domestic deposits.

The latest estimate of world zinc reserves outside the United States places measured and indicated categories at 71,000,000 s. tons, but this figure is unquestionably understated. Inferred reserves are judged by the Bureau of Mines to be at least equal to the sum of measured and indicated reserves.

It is thought probable that the future growth in world zinc consumption will be somewhere between 321,000,000 s. tons and 217,000,000 tons, based on the average growth rates of 4.1 per cent and 2.4 per cent for the periods 1950-60 and 1955-60 respectively. At the lower level, the required additions to world reserves would be more than twice current measured and indicated reserves, even without allowance for the less than 100 per cent recovery of metal from ore. The occurrence of zinc as an accessory in many types of mineral deposits is a favourable factor. Nevertheless a large element of uncertainty remains, which is emphasised by the lack of any information on potential ore outside the United States.

Probable Coal Production in Europe, 1961

The following article outlines the position of Europe's production and stocks during 1961, giving probable estimates to the end of the year. Covering output of both anthracite and bituminous coals, the source of the article is reports from the Economic Commission for Europe, 1961.

AN examination of Europe's (excluding the U.S.S.R.) reported probable production of coal (anthracite and bituminous) in 1961 indicates reduction of approximately 6,400,000 tons from the 1960 output. The forecasts provided by participating members of the Coal Committee of the Economic Commission for Europe (ECE) show production at 579,600,000 tonnes in 1961 compared with 586,000,000 tonnes actually produced in 1960.

In the European Coal/Steel Community (ECSC) production will show a decline of nearly 2,000,000 tons from 1960, most of which is attributed to a reduction of about 1,800,000 tons in the French output. A slight upturn is noted in the West German and Netherlands production.

The greatest production loss is noted in the United Kingdom where the estimate for the year indicates a drop of about 8,000,000 tons from last year. Declines, which in the last five years have resulted in lowering output from 227,000,000 tons to the current level of 189,000,000 tons has resulted in a better balance between production and demand, in addition to relieving the problem of excessive stockpiling.

With the exception of Czechoslovakia, where reports of shortfalls in production plans during 1961 have been indicated, a higher rate of output is forecast for East *bloc* countries. In Poland, output of coal is expected to reach almost 107,000,000 tons, overfulfilling the production target of 105,500,000 tons announced earlier in the year.

The following tabulation compares the forecast of coal production in 1961 with actual output reported in 1960:

Coal† Production ('000 tonnes)

Country	*Forecast* 1961	*Actual* 1960‡
*ECSC**		
Belgium	22,450	22,465
France	54,210	55,960
Germany (West)	142,900	142,287
Italy	730	737
Netherlands	12,900	12,797
Sub total	233,190	234,246
Other Europe		
Czechoslovakia	27,380	27,626
Hungary	2,910	2,847
Poland	106,800	104,439
Spain	14,100	13,769
Turkey	3,690	3,640
United Kingdom	188,800	196,829
Yugoslavia	1,340	1,283
Other	1,390	1,365
Sub total	346,410	351,798
Total Europe‖	579,600	586,044

* European Coal/Steel Community.
† Anthracite and bituminous.
‡ Quarterly Bulletin of Coal Statistics, ECE, Geneva 1961.
‖ Excluding the U.S.S.R.
Source: Economic Commission for Europe, Geneva.

Major West European coal producers will have taken 10,700,000 tonnes from their accumulated stocks in the 12 month period ending December 31, 1961. This estimate is based on the assumption that production forecasts given for these countries for 1961 are realized. Pithead stocks of coal in the producing countries listed in the accompanying tabulation are expected to decline to 46,800,000 tonnes when compared with 57,500,000 tonnes as of December 31, 1960.

Among the countries listed in the following table, only West Germany is expected to show coal stocks at the end of 1961 in excess of a year ago. In Belgium, the critical period of high inventories appears to have ended and stocks are now at a satisfactory level and continuing to fall. By the end of the year pithead stocks are expected to be over 1,000,000 tons under those of December, 1960. While there has been only an insignificant reduction in France's coal surplus position, that in itself is an improvement over the rising stockpiles which have plagued the French coal industry in the past few years. Stockpiles of British coal continue to be influenced almost entirely by lower output. Pithead stocks are expected to fall to 18,000,000 tonnes at the end of 1961, or less than half of the record level of 36,900,000 tonnes established in November of 1959. In the twelve month period ending December 31, 1961, about 11,700,000 tonnes will have been taken from stockpiles to satisfy the demand.

Pithead Stocks ('000 tonnes)

Country	*Estimates* *December* 31, 1961	*October* 1, 1961	*Actual* *December* 31, 1960
Belgium	5,523	5,800	6,565
France	13,220	13,204	13,328
Germany (West)	9,550	9,500	7,143
Italy	8	8	93
Netherlands	450	575	655
United Kingdom	18,000	22,100	29,667
Total	46,751	51,187	57,451

Position of Australian Coal

BROWN coal deposits in N.S.W., near Griffith, cannot at present be economically exploited. This was recently stated by the Minister for Mines, the Hon. J. B. Simpson. Compared with the vast Victorian deposits, those in N.S.W. are relatively thin, bearing in mind the greater thickness of cover. Recent borings have been disappointing in that only some 40 ft. of seam has been proved and this lying at a depth of 330 ft. However, a 12 ft. seam of black coal, suitable for the manufacture of metallurgical coke has been found at 950 ft.

In Queensland, a deep belt of coal interspersed with clay bands, has been proved by Western Australian Petroleum Pty. Ltd's. exploratory borehole near Three Springs. The Queensland Minister for Mines has created a coal reserve over an area of 3,000 square miles surrounding the site. Although the coal lies more than 6,000 ft. below the surface and, therefore, is an uneconomic mining possibility at the moment, hopes exist that the seam may be proved to rise to a point at which mining operations would be practicable.

The tenth annual report of the Queensland Coal Board for the year 1960-61 is one of great contrasts. Despite an all time record individual productivity, total output was down by 124,000 tons to 2,600,000; a decrease directly attributable to the large number of strikes during the year.

Although the Australian coal industry came near to committing industrial suicide in the immediate post-war years because of industrial unrest, there had been very encouraging signs that labour relations within the industry had significantly improved. Considering the hard fight that coal is currently waging against competitive fuels, the state of affairs revealed in this annual report does not augur too well for the future of the coal industry in Queensland.

Machinery and Equipment

Shuttle Minecar for Low Workings

The Shuttle Minecar, with a 10 ton payload, and an overall height of only 7 ft. 9 in. has been developed by Aveling-Barford Ltd., in collaboration with Stewarts & Lloyds (Minerals) Ltd. The reduction in height has been achieved by setting the operator's seat and controls closer to the footplate than on the Aveling-Barford 10 ton SR shuttle dumper, dispensing with drive axle leaf springs, and fitting a specially designed body with an exceptionally low lip at the scow-end, for use with any underground loading machine with which it may be teamed. Loading height is only 4 ft. 10½ in., yet capacity is 7 cu. yd. heaped, and payload is 20,000 lb. The operator is protected by a sheet steel canopy, but a back plate for the body can be added if desired. As the car is loaded from the end rather than from above, the usual cab protection plate is dispensed with, saving inches in height.

Another feature is the reversible driving seat and dual controls that Aveling-Barford have been incorporating into their dumpers for twenty-five years, enabling the operator always to face the direction of travel. In the confined areas of tunnels, the Minecar can be reversed instead of turned around.

Other components and assemblies, already used in the SR 10 ton dumper, include the standard transmission, giving four forward and two reverse speeds between 4.23 and 24.5 m.p.h., and an alternative reduction gear, which can be fitted into the drive axle to reduce road speeds and allow the full range of gears to be used. A number of prototype Minecars have been in continuous operation for the past eighteen months at Thistleton, Rutland ironstone drift mine of Stewarts & Lloyds, where, it is claimed, conditions are such as to test every part of the machine to the utmost. Production units are also in operation at the Easton mine of The United Steel Co.

ROTARY ELECTRIC COMPRESSORS

The Air Power Division of Joy-Sullivan Ltd., announce the latest addition to their range of air compressors. The new machine, the RE.600, is an electrically driven two-stage rotary vane, oil-flooded type compressor with a free air delivery of 600 c.f.m. at 100 p.s.i.g. Maximum operating pressure is 120 p.s.i.g. Designed for heavy duty applications, the RE.600 is mounted on a robust channel section steel skid, with or without rail wheels, and is particularly suitable for underground operations in which the demand is for an easily moved compressor that can be kept close to the workface.

Because the RE.600 can be moved directly into the working area, air pressure at the face is appreciably higher than when piped from a distant permanent installation of similar working pressure and capacity. Leakage and friction losses in the piping are reduced to an absolute minimum and there is no necessity for a bulky air receiver.

Design of the rotary vane type compressor unit is identical to that of the Joy 'Airvane' portable compressor of similar capacity and incorporates a side-by-side cylinder arrangement housed in a one-piece cast iron stator housing, with helical gear drive between L.P. and H.P. rotors. Full provision is made to prevent rotor end play, while allowing for expansion and contraction. A hardened bevel on the trailing edges of the rotor slots minimizes vane wear and the counter-bored cylinder ensures adequate internal air sealing.

Compressor and electric motor are coupled as a compact unit in an oil-flooded gear box designed for arduous, heavy duty operation. Helical gearing gives a speed increase of 0.77 : 1. No clutch is required between electric motor and compressor.

Brush electric motors fitted to the RE.600 develop a maximum of 160 b.h.p. at 1,440 r.p.m. A choice of squirrel cage screen protected, totally enclosed fan cooled, or totally enclosed flameproof motors can be supplied to Buxton certified standard. Voltages are 440-600 v. and 2,750-3,300 v., 50 cycle supply. The motors are specially designed and incorporate a flange for direct mating to the gear box.

A positive displacement gear-type pump driven by the h.p. rotor shaft provides flood-lubrication for the compressor and feeds all moving parts, including the drive gears. Air temperature is effectively lowered by the oil, which also acts as a compression seal between vanes and cylinder walls. The oil is cooled continuously by passing it through a tubular-type fan-cooled heat exchanger. The oil is removed from the air in several stages and before discharge is passed through a Fibreglass air/oil separator mounted inside the air receiver. A highly efficient air-intake filter is fitted and full-flow oil filters are included in the lubrication system.

The RE.600 has a "Fail safe" safety circuit which will stop the compressor should the air discharge temperature exceed 225 deg. F. Units can operate safely in ambient temperatures up to 125 deg. F. More elaborate "fail safe" systems can be fitted to meet particular requirements.

The control panel mounted on the compressor provides visual readings of inter-stage and final discharge air pressures, and discharge air temperature. An air operated pilot valve assembly is incorporated for easy adjustment of air discharge pressure.

For easy transportation in restricted spaces—such as in mines, tunnels and pit shafts—the skid mounting of the standard RE.600 is designed so that it can be split into two sections, one carrying the compressor, heat exchanger, electric motor and gear box; the other carrying the air receiver, air/oil separator, filters and accessories. The separating operation is simple, requiring only the removal of a few bolts and uncoupling of the air and oil pipes. Siting of the air receiver is arranged to facilitate access to the pipe manifold and permit easy removal of the air/oil separator.

LOADER FOR SHAFT SINKING

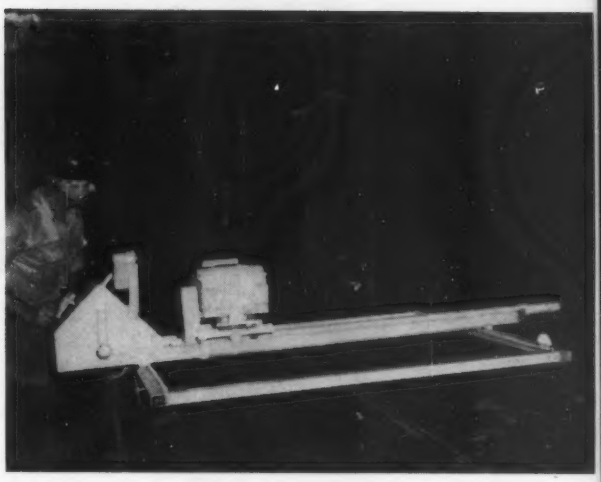
A special loader has been developed by Eimco Corporation which is now in use on the Witwatersrand and O.F.S. goldfields, where speed is an essential factor in shaft sinking. The new rocker shovel loader for shaft cleaning, Model 631, is an enlarged version of the Model 630, which has already been used on 11 shafts in South Africa. The 631 has a discharge height of 8 ft. 6 in., which is sufficient to fill the large kibbles of 10 and 12 tons capacity, at present used in the mining fields.

The Model 631 is a crawler mounted machine, powered by three air motors; two Eimco 251 air motors, of 15 h.p. drive the trucks, and an Eimco 271 air motor 22 h.p., powers the bucket drive. While some of the parts of the Model 631 loader are similar to those on Model 630, different types of buckets can be supplied for the particular requirements of each mine in which they are used. Eimco treat each loader application individually, and modifications can be effected to a considerable extent, to meet local conditions.

Minecar in operation at the Thistleton mine of Stewarts & Lloyds (Minerals) Ltd.

The Eimco Corporation is introducing two new air motors, which afford substantially increased power and valve life over existing types, according to the company. Designated the Eimco 251 and the Eimco 271, the new air motors are physically interchangeable with the standard Eimco 201 on all applications.

The new air motors are both of the well proved five cylinder radial type. The principal improvements are in the design of the air passage and of the rotary valve, which offers better air flow and is carried on anti-friction ball bearings. Thus, there is no rubbing contact between the valve and the valve housing and the expensive bronze bushing is eliminated. Tests have proved that in addition to increased power and speed, greatly increased valve life results. Loss of power due to wear of the bushing and valve has been virtually eliminated and replacement costs of worn valves over the life of the motor have been reduced. The new air motors also give a considerably wider choice of positioning, on any machine or for any other use.



One - man coal cutting machine, powered by an electric motor, driving a 2¾ in. auger bit. This machine drills a series of 15 holes in a straight line, making an undercut of the coal mine face. It is operated by one man using two handcranks, one to feed the auger bit into the mine face and one to move the auger assembly laterally along a rack-and-pinion positioning device.

ONE-MAN COAL CUTTER

Details have been disclosed of a new American coal-cutting machine, which its designer, O. Wayne Martin claims can be operated by one man. Such a machine might be expected to find wide use in very small mines owned and operated by individuals in their spare time, as well as in large mining companies which are finding it increasingly necessary to exploit thin seams.

The manufacturer of the prototype machine, Sherman G. Martin, states that the machine weighs less than 200 lb. and is built on a square tubular frame which is 5 ft. long and less than 4 ft. wide. A high-power electric motor, mounted by rack-and-pinion on the tubular frame, drives a carbide-tipped auger bit through a cylindical jacket into the coal face. By indexing the auger location in a series of positions laterally along the rack, the machine operator is able to drill a series of holes in a straight row so as to undercut the entire coal face. The coal can be made to fall away quickly into the undercut with a small dynamite blast from above.

One man can move the cutting machine to various locations in a mine and can operate it without assistance from others.

The machine is 16 in. in overall height and can be operated in seams as narrow as 20 in. high.

The machine is to be marketed by the newly formed Mighty Miner Company, a division of Shallway Corporation of Connellsville, Pa.

NEW FLAMEPROOF EQUIPMENT

Craven Electronics Ltd. (a Sutcliffe Company), announce the introduction of new flameproof temperature and level control equipment.

The equipment consists of two units, a probe with a flameproof terminal chamber which is fitted into the hydraulic reservoir, and the control unit which is also flameproof and may be remotely mounted. Relevant certificate numbers are Ministry of Power Certificate No. IS 1226 (Methane) and Factory Inspectorate Certificate No. IS 2087 (Pentane Class).

Both temperature and level are sensed by similar detectors housed in the probe tip. These are temperature sensitive resistors connected in A.C. bridge networks. For the temperature control arrangement, the bridge is arranged to be exactly in balance at the trip temperature level. The bridge output signal is then alternating voltage which, when the temperature is below the trip point is in phase with the bridge energizing supply and 180 degrees out of phase above the trip point. A transistor circuit detects the phase change, which is an instantaneous reversal at the trip point and causes a relay to become de-energized.

The level detector is similar except that the sensing resistor has a small heater winding incorporated. Providing that the liquid level is above the tip of the probe, any heat generated by the heater winding is dissipated in the tank contents (this holds good to temperatures in excess of the temperature trip setting). If the liquid level falls to expose the tip of the probe the heater coil now causes the sensing resistor to heat rapidly which in turn creates conditions exactly as for the temperatures sensing unit.

All the circuits are designed to "failsafe" in the event of breakdown or failure of any component. A further feature of the equipment is a check arrangement which allows the probe and amplifiers to be tested without removing the lid from the case. The tests are carried out by inserting a key and rotating. This turns a test switch inside the enclosure and correct circuit action is shown by means of 3 coloured lamps behind a window in the lid. The equipment is designed to operate on a supply from a standard intrinsically safe signalling transformer.

CEMENTATION AND SILICATIZATION IN POLAND

Polish technical press gives an account of the sinking of the Kazimierz No. 2 shaft of the Niwka Modrzejow colliery, which was sunk with an inner diameter of 18 ft., and was intended for a final depth of 2,100 ft. Freezing holes were drilled from the surface to a depth of 90 ft. and after sinking to that depth, the section was lined by brickwork and concrete. When sinking continued through sandstone, water began to seep into the shaft at a growing rate until the latter amounted to 66 g.p.m. at a depth of 150 ft. When this had risen to 242 g.p.m. at a depth of 165 ft., it was decided to drill cementation holes through the lining at a depth from 50 to 65 ft. and to inject grout. Injection of 80 tons of cement solution brought only a slight reduction in the water influx. Injection of a further 220 tons into the lower-lying sandstone from the 150 ft. horizon upwards succeeded in reducing the water influx to 154 g.p.m.

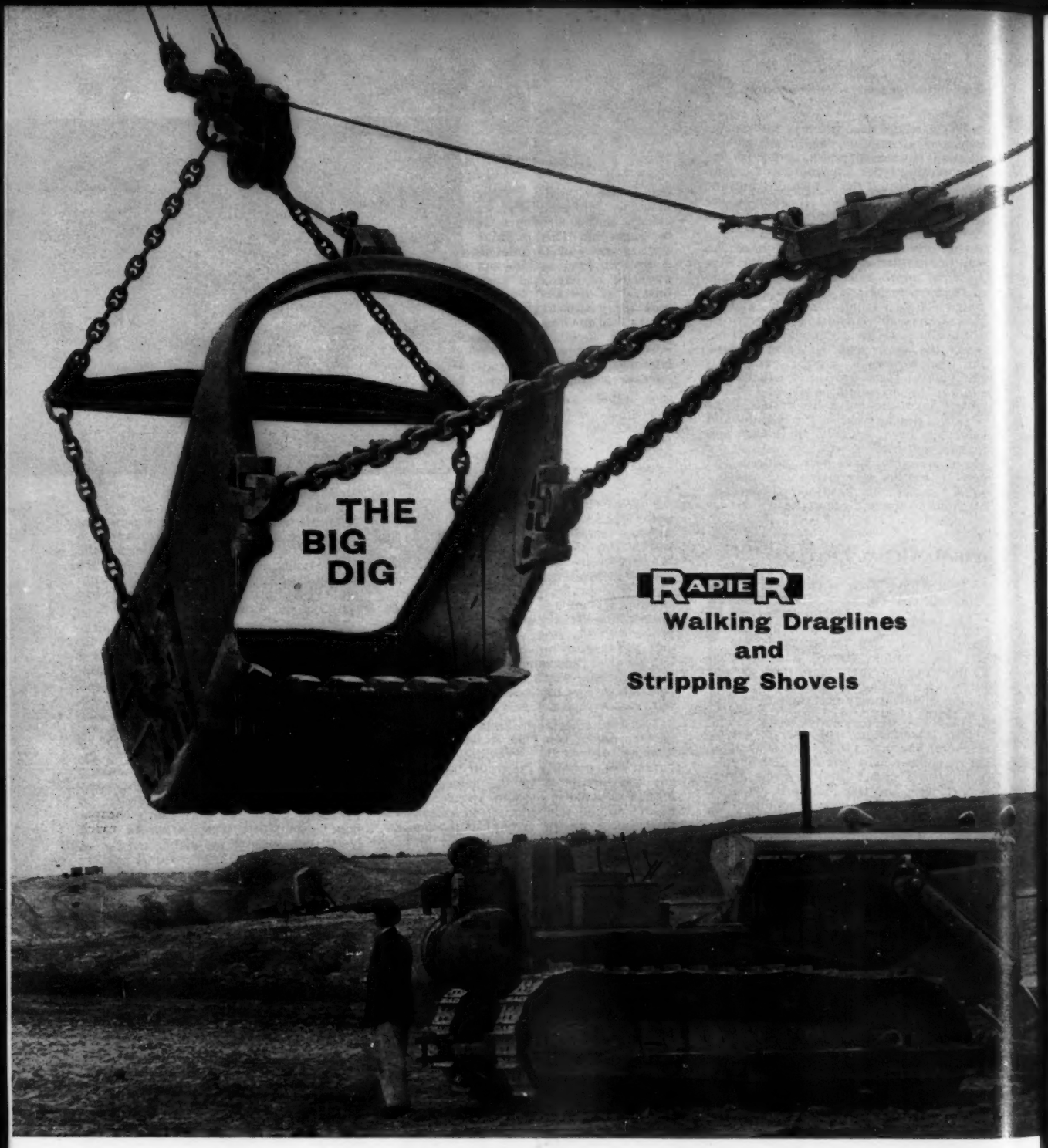
It was decided to go over to silicatization, i.e. the injection through 1⅞ in. diameter holes, drilled in the lining of a solution of water glass and calcium chloride. Sections from 50 to 23 ft. and from 165 to 150 ft. were treated by this process. The injection time for each hole varied from 20 to 40 min. and the amount of solution per hole from 150 to 330 gallons. This reduced the water influx to 22 g.p.m. which enabled sinking to proceed. A calculation of the costs proved that silicatization was under the particular conditions very much cheaper than cementation, apart from its much higher effectiveness.

NEW BORING SYSTEM

A new technique developed by the Alkirk Corporation of Seattle may have a significant influence on the future design of large diameter boring machines. Although several roadway boring machines have been tried underground, with varying degrees of success, these have often been limited in their application by lack of stability of the machine in operation. In the past most of these machines have achieved the necessary forward thrust by means of bracing or pushing from behind. This system has obvious disadvantages and there has been, in consequence, only limited development of large diameter boring machines.

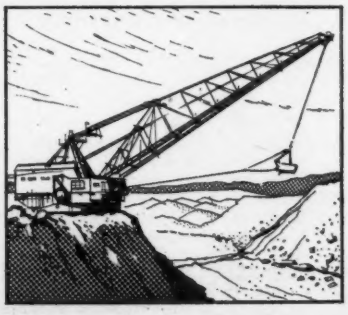
With the Alkirk system the machine is hauled into the face of the heading by ultilizing a pilot which is anchored in the material ahead of the borer. One machine employing this method is the Alkirk Cycle Miner which has been in operation in a colliery in Alaska for some time. This machine is cutting twin 7 ft. diameter holes in a coal seam and loading at the rate of 15 tons per min.

Another new product using the so-called Pilot-Pull principle is a 14 in. dia. concrete drill manufactured by the Lawrence Machine and Manufacturing Co. This drill anchors itself in a small pilot hole and then reams this out to 14 in. dia. without an external bracing or restraining jacks.



If you want to dig ton after ton of overburden, ore-bearing minerals or clay for bricks . . . if you want to go on doing it day after day, year after year . . . then you want one of two things . . . a RapieR Walking Dragline . . . or a RapieR Stripping Shovel.

What a wealth of experience this sturdy, world-ranging British Company has packed into its 90 years of progress. Some of the world's biggest Walking Draglines come from its vast construction shops . . . in drawing offices and test laboratories brilliant men scheme and dream of even greater triumphs, basing them firmly on the experience, integrity and careful craftsmanship that have always belonged to Ransomes and Rapier.



Ransomes & Rapier Limited, Ipswich, England

A NEWTON CHAMBERS COMPANY

VIBRATORY HANDLING EQUIPMENT

A wide range of vibratory handling equipment is being introduced by the British Manufacture and Research Co. Ltd.

This includes a more powerful type of feeder capable of delivering up to 400 tons/hour of suitable material. The feeder is of the simplest possible construction and is powered by two rotary vibrators, these produce a fairly large vibratory movement of about ¼ in., thus assisting the flow of material from the bunker.

In addition to the feeder, a vibratory conveyor with similar drive is available in multiple lengths of 20 ft. for handling hot, abrasive and dusty materials. A number of inlets and outlets can be incorporated and a totally enclosed system still maintained.

Another Vimarc product is the linear action screen, which can be installed horizontally so that material is actually conveyed forward by the cloth, to obtain the best possible screening.

All these machines are of basically similar design and have only two moving parts, the independently powered electrical vibrators. The manufacturers claim that maintenance is thus kept to an absolute minimum, and the freely sprung mounting ensures that no vibration is transmitted to the supporting steelwork.

NEW RANGE OF BELT WEIGHERS

A completely new range of totalizing belt weighers to meet a wide variety of requirements for totalizing the weight of material passing over a conveyor belt is announced by W. & T. Avery Ltd. The machines are designed to fit into an existing conveyor system and are suitable for either horizontal or inclined installations.

The mechanical totalizing mechanism is totally enclosed and dust-sealed within the scale headwork. Totalized weight is shown on a 7-figure counter and pendulum type indication provides continuous indication of rate of feed.

Electrical signals are obtainable from the belt weigher which enables associated plant to be automatically regulated according to the rate of flow of material. Remote totalizing and indication or recording of rate are also available.

W. & T. Avery have also brought out a new range of predetermined weight feeders, in which the weight to be delivered is set either at the machine or at a remote point, and a new range of constant rate feed scales.

*

Witton-Kramer direct-current solenoids are the subject of a revised publication, Technical Description No. 317, available from the Publicity Department of the Witton Works of G.E.C. (Engineering) Ltd.

These d.c. solenoids are designed for operating brakes on electric cranes, winches, hoists and similar types of plant in which the principle of solenoid operation can be employed. Three types of winding are available, namely shunt-wound, series-wound for resistance control and series-wound for potentiometer control. In addition three standard ratings are available : normal duty, heavy duty and continuous duty.

T.D. No. 317 gives a full description of the construction of these G.E.C. d.c. solenoids together with tables indicating the types available, their consumption, pull, strokes, weights and dimensions.

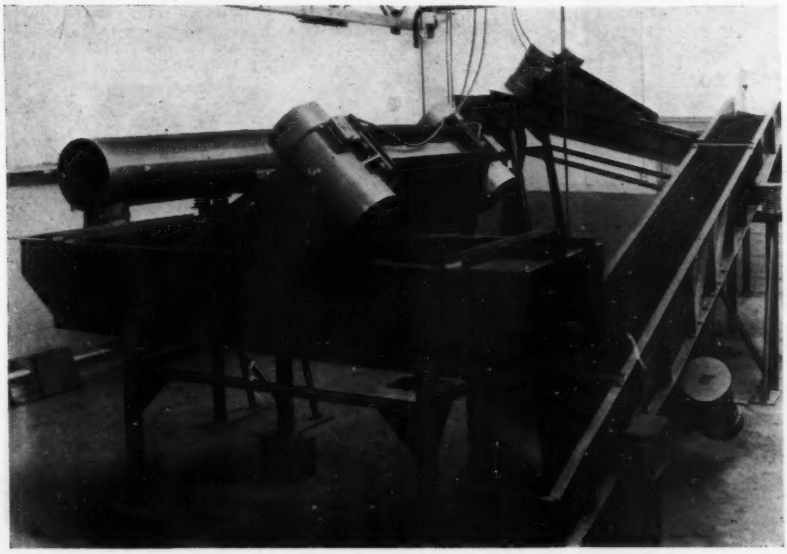
*

Solus-Schall are marketing a new type of pressurized container, the Flexi-spray, to spray their Spotcheck penetrants, Zyglo fluorescent penetrants, magnetic inks and associated materials on to specimen for the detection of cracks, flaws and other defects. The Flexi-spray consists of a power unit containing a gas propellant; a separate storage unit to contain the material to be sprayed; and a plastic moulding with valve mechanism which fits both these units.

*

A non-lethal 0-5 kV RMS 50 cycles a.c. flash tester is being manufactured by Witton Electronics Ltd. Housed in a robust steel case, including carrying handle and incorporating voltage indicating meter fuses, on/off switch electronic circuit and terminals. The equipment is complete with variable voltage setting potentiometer and push to operate button. Maximum short circuit current 1 MA earth lead and H.V. probe are included.

Vimarc vibratory feeder



Recent Developments In Comminution

The use of a hydraulic ram instead of a pair of toggles, to drive the moving jaw of the Gauldie breaker, made by Köppern & Co., under licence from Hydraulic Crushers of Toronto, was reported in the technical Press. The hydraulic action, altering the rhythm, maintains the "open" time and reduces the "closed" time by a third, thus increases the frequency of the jaw movements and throughput of ore. An improvement is also claimed in the sharp impact of the breaking action.

The moving jaw is of conventional design, its downward movement resulting from a downward movement of the hydraulic pump. Some of the hydraulic oil is used for lubrication, both for the hydraulic pump and for the ram main bearings, through small holes drilled in the plungers. The ram is driven back by a spring. At alternate down-strokes of the hydraulic pump, a valve directs oil into an air-loaded accumulator, preventing the ram from being driven out, and allowing the jaw to open. At the next up-stroke of the pump, the accumulator releases the oil, and the moving jaw recloses. An overload valve acts as a safety device, releasing the oil pressure, and stopping the movement of the jaw when an unbreakable object is fed into it.

New Turbo Pulverizer

A new grinding machine, known as the Law Turbo Pulverizer is being produced by Hirsch Brothers Machinery Co., in Texas. This machine, claimed to be both efficient and inexpensive, uses fast-moving air to effect the grinding of friable materials into particles of controlled size of almost infinite fineness. Back pressure, governed by a damper, ensures uniformity in size of the ground particles. The harder the material, the faster it is pulverized. The manufacturers claim the cost as being one-fifth of conventional industrial pulverizing equipment. In addition, the Law Turbo Pulverizer can be modified to separate into threads fibrous materials such as asbestos.

Rugged Rock Carrier

Keir & Cawder's Rok-Feeder, designed to take the load direct from large dump trucks, are of rugged construction, and include apron plates and chains on shock absorbers, which relieve the stresses to the apron and supporting structure. They are made in a range of sizes from 24 in. to 72 in. wide.

The feeder is driven by a totally enclosed high torque squirrel cage motor, with heavy duty contactor type direct-on-line starter fitted with isolator and suitable for inching duty. The motor shaft is direct coupled to the input shaft of a totally enclosed worm reduction gear through the medium of a flexible coupling of ample strength to meet the maximum load to be transmitted. The countershaft is driven by a totally enclosed chain drive from the low speed shaft of the reduction gear unit. To the countershaft is fitted a spur pinion meshing with a spur wheel mounted on the feeder head shaft. The gearing runs in a totally enclosed oil bath. Guards are provided over the drives.

The standard machines are fitted with constant speed drives, or variable speed units.

MINING MISCELLANY

Developments in Colombia.—The U.S. company, Minnesota Mining and Manufacturing has established a factory in Soacha, near Bogota, Colombia, among their projects being the manufacture of abrasives, at present imported. A factory for the manufacture of caterpillar tracks is also expected to be installed. Equipment valued at $U.S.7,000,000 will probably be imported from Spain.

Operation "Triangle" for Bolivian Mining.—Operation Triangle is the name given to the contract signed between the State Mining Corporation (Comibol) of Bolivia, and the Inter-American Development Bank, under which the latter agreed to make available a credit for $4,500,000 as its contribution to the first year of the plan. The U.S. Government's share of $3,500,000 had already been granted on March 1, and the signing of an agreement covering West Germany's contribution of $3,750,000 to be administered by the I.A.D. Bank is expected shortly. Argentina has granted a credit of $1,500,000 to be spent on the mines commissary supplies and the U.S. Operations Mission have made a supplementary loan of $1,500,000 as emergency aid. This plan provides for a total investment in the first year of $16,000,000 in the second of $14,000,000 and in the third $7,000,000, and a Supreme Decree which has been signed, lays down conditions on labour problems and orders the suspension for three years of payments by retentions on the sale of tin as compensation to the former mine-owners. This has since been put into effect; one British tin-smelting firm is affected. Orders worth over $1,500,000 have been placed, mainly with U.S. suppliers for machinery. British exporters are expected to have a fair chance of tendering for contracts financed by the German and I.A.D. Bank credits. So as not to jeopardize "Operation Triangle", President Kennedy has promised that no releases of tin from U.S. strategic stockpiles would be made without consulting Bolivia first.

Bolivian Gold Production Up.—Production of gold from the co-operative mines at Tibuani has continued to increase, the output for the first eight months of 1961 reaching 546 kilogrammes.

Japan's Interest in Costa Rican Deposits.—Japan is reported to be interested in the planned development of the iron ore deposits in the Nicoya Peninsula in south east Costa Rica, which are to be developed by the International Iron Ore Co. of Houston, U.S. The deposits are estimated to have reserves of about 200,000,000 tons of ore.

Australian Lead Oxide for Indonesia.—An Australian company, Commonwealth Lithage and Red Lead, of Sydney, is shipping 250 tons of lead oxide to Jakarta, Indonesia, where a promising export market is said to be developing.

Rock Stresses in Drill Holes.—A new device for measuring the stresses set up in earth strata has been invented by Mr. A. H. Wilson, in collaboration with the British N.C.B. Mining Research Establishment. The borehole plug comprises an element sensitive to variations in ambient stress and has an axis with at least three active gauges, arranged so as to be collectively sensitive to strain in any direction in the common plane.

Exploration in the Yukon.—As a result of work over the plant over the past few months, reports *The Northern Miner*, Conwest Exploration (80 per cent) and Central Patricia Gold Mines (20 per cent) are to launch a heavy and extensive exploration programme costing a minimum of $400,000, on their silver-lead property in the Yukon mountains. Work is being started on the counstruction of a 100-mile winter road from the Alcan Highway north of the property, which is likely to cost $70,000 alone, though some federal assistance may be forthcoming. No less than 14 separate veins have been found, all of which carry high silver-lead values. In addition, there are at least four areas of high grade float material the origin of which has yet to be determined.

Chattanooga Shale Study.—A detailed report on the uranium-bearing black Chattanooga shale in Central Tennessee and nearby parts of Kentucky, Georgia, Alabama and Mississippi, covering some of the most perplexing and controversial geologic problems of the Eastern U.S. has been released by the Geological Survey, Department of the Interior, and may be purchased from the U.S. Government Printing Office at $2.75.

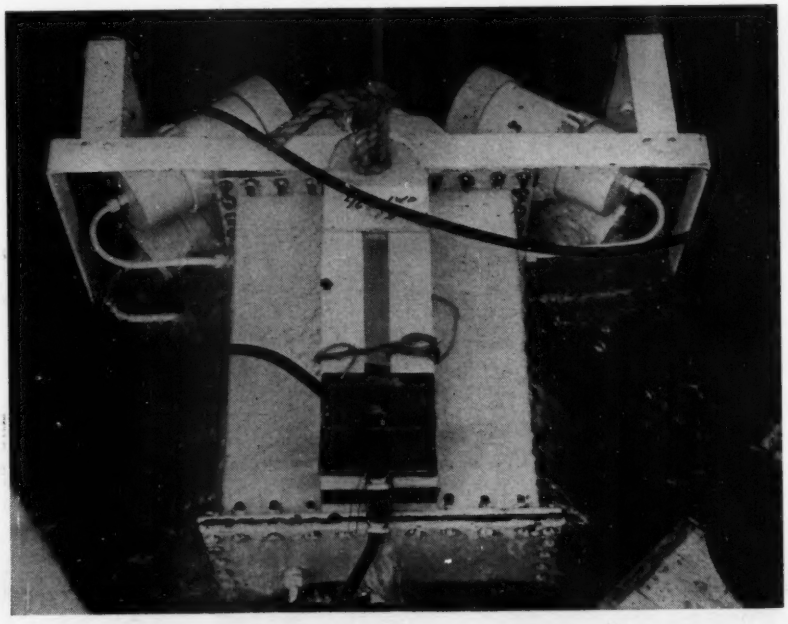
Giant Australian Dragline.—A walking dragline weighing 900 tons has been demonstrated at Leigh Creek brown coal field in South Australia. The bucket can gouge out 18 cu. yd. of overburden at one bite, and the beam is 235 ft. long. This dragline would enable the Electricity Trust to bring coal production to 2,000,000 a year for the new power station, due for completion at Port August by next winter.

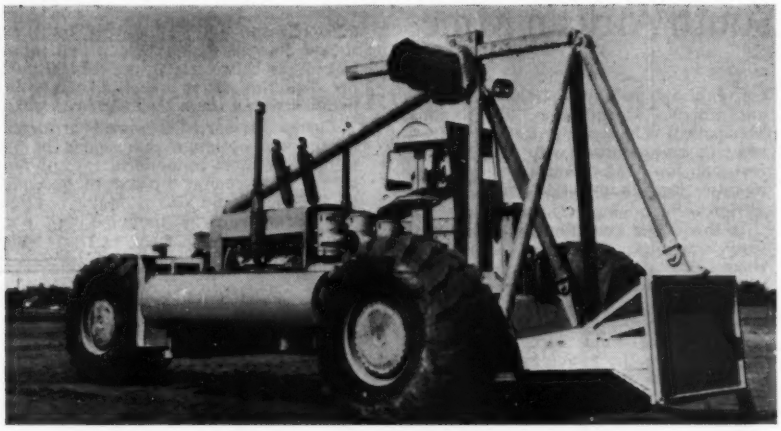
Reward for Uranium Find.—The Australian government is to pay a reward of nearly £A15,000 to the discoverers of the Eva uranium deposit at Pandanus Creek, in the Northern Territory. The field is 100 miles south of the Gulf of Carpentaria, near the Queensland border. The biggest rewards paid for finding uranium in Australia were £A25,000 each for the discovery of the Rum Jungle and the Mary Kathleen fields.

Commonwealth Mining enters Alabama.—The recently formed Commonwealth Mining Co. has entered into agreements with the Glenwood Mining Co. of Alabama and Southern Development Co. of Geneva, whereby it has acquired full control over deposits of brown iron ore in approximately 35,000 acres situated in six counties of South Alabama. Production of strip mining is to be stepped up and it is expected that 2,000,000 tons of iron ore a year will be shipped to Japan and Germany. The first shipment is scheduled to leave in February, 1962. If plans work out as anticipated a pig iron plant costing $3,000,000 or more will be constructed in about two years. The company has a process which will concentrate the ores to 58 per cent iron. Commonwealth has also obtained leases to mine brown ore on a total of 40,000 acres in Georgia and Mississippi, from which it is expected that a further million tons a year will be produced.

Iron Ore in Mexico.—An extensive iron field said to amount to at least 100,000,000 tonnes is officially reported to have been discovered in the vicinity of Pena Colorado in western Colima State, Mexico. Mining, it is stated, will be undertaken with the participation of private enterprise under government supervision.

The use of a closed-circuit television camera for direct underwater investigation in an oil refinery has been pioneered by Shell Nederland in their 300,000 b/d oil and chemical plants at Pernis, near Rotterdam. The camera and the monitoring apparatus at the Shell Pernis refinery were supplied by the Philips electric and electronic equipment manufacturers at Eindhoven. A watertight metal case was made by the refinery's technical department, to hold the camera clamped in between rubber blocks. The equipment has obvious applications in mining





Latest entry in the "drawbar derby" is an 840 h.p. tractor on rubber tyres which is intended to supplant tandem pushers for loading big-capacity scrapers. The big diesel-electric machine is designated a Series K-103 "Pacemaker" Tractor—a new trade name for electric wheel earthmoving equipment manufactured by R. G. LeTourneau, Inc., United States. The electric drive combination develops over 90,000 lb. of drawbar pull. Dimensions are 42 ft. long by 15 ft. wide by 16 ft. high

Nuclear Energy Plans in Brazil.—Government approval has been obtained for the proposal to proceed with plans for a 300 mW. natural uranium nuclear power reactor in the Rio de Janeiro/Sao Paulo area. Shortly before the resignation of President Quadros, the National Commission for Nuclear Energy issued notices to foreign firms, asking them to submit proof of their experience in the construction of large reactors. The new administration has not yet issued a final statement of policy with regard to this project, but the Minister for Mines and Energy is reported to have said that he was in favour of it.

New Finnish Copper Mine.—A new copper mine is to be opened at Luikonahti, Kaavi, provided railway communications can be arranged. The ore field is estimated to contain between 7,000,000 and 8,000,000 tons of ore, with a copper content of 1.5 per cent.

New Iron Mine in Ontario.—A new iron ore mine is coming into production on the Kukatush range, about 42 miles south-west of Timmins. An open-pit mine will be operated, on a hitherto underdeveloped area covering some 10,600 acres, to recover 320,000,000 tons of magnetite ore. Plant to concentrate and pelletize 2,000,000 tons of premium grade (65 per cent) iron ore for sale is to be installed, and a planned production is envisaged at the mine-site, of 1,000,000 tons of iron concentrates for shipment to Depot Harbour, via Lake Huron to the steel producing centres of Canada and the U.S.

Peruvian Exports Rising.—Exports of minerals from Peru have risen steadily throughout the first half of 1961, the total value for the main five minerals being 13 per cent higher than for the same period in 1960. The drop in international quotations for lead and zinc in 1961, has caused some concern in Peruvian mining circles. The Mining Bank announced that work will start in 1962 on the construction of a zinc refinery near Callao. The plant, to cost U.S.$16,000,000, will have an annual output of 22,000 tons of refined zinc and will start production in 1965. Belgian interests are reported to be concerned in this scheme.

Dolomite Projects in W. Germany.—The Rheinisch-Westfälische Kalkwerke AG, of Dornap, Western Germany, have obtained concessions for exploiting the dolomite reserves in the Daun area of the Eifel Hills. Lease agreements have already been drawn up for certain areas in the Gönnersdorf-Lissendorf region, but no date for commencing operations has yet been announced.

Formosan Atomic Development.—The Taiwan Power Co. have reported plans to instal an atomic power plant by 1968, with a generating capacity of 200,000 kW., at an estimated construction cost of U.S.$5,000,000. The plans have been approved by a mission from the International Atomic Energy Agency, which visited Formosa last August.

W. German Steel Investment.—It is expected that total investment by the steel industry in Western Germany in 1961 will amount to DM 1.44 milliard which is about DM 200,000,000 higher than the previous peak investment of 1957. As a result of this new investment, crude steel capacity has risen to about 36,500,000 tons. However, it is believed improbable that more than 33,000,000 tons will be produced during 1961, about 1,100,000 less than in 1960.

Coal Output in Formosa.—Production of coal, which is Formosa's most important mineral, is rising sharply, and reached 2,000,000 tonnes in the first half of 1961. This represents 53 per cent of the 1961 target, and almost 8 per cent above the comparable 1960 figure. Inventories are reported to be growing, and are expected to grow still further. The Coal Mine Operators' Association is considering a plan to cut back production by 15 per cent, and strong efforts are being made to win new contracts for export sales to Japan and Korea. The industry is seeking approval for an increase in coal prices of 27.5 per cent (based on increasing production costs), but it is considered unlikely that this will be granted in present circumstances. However, a ten-year development plan has been drafted to increase production by 54 per cent, as estimates indicate a shortfall on production by 1963 unless new mines are opened. The Taiwan Power Co. is expected to be a big consumer.

Blasting Costs Down.—The Explosives Division of Canadian Industries Ltd., have announced a substantial decrease in the price of Amex II, an ammonium nitrate fuel oil blasting agent. Reasons given for the reduction were that development work is now largely completed and involves less expenditure, and that profits from sales are expected to increase with the wide outlet of applications for this product.

Tax Survey.—The Organization of Economic Co-operation has published a survey of taxation systems in overseas territories associated with the U.K. and France, as at the end of 1959, insofar as they apply to investments. The object of the survey is to examine the special measures taken to promote investment, and assess their effects.

Rhine Salt Deposit.—The French firm, Mines Dominiales de Potasse d'Alsace, is currently studying the possibilities of exploiting a salt deposit under the bed of the Rhine.

Coal Search on Fraser Island.—Blair Athol Open-Cut Collieries are to start drilling programme on Fraser Island, near Maryborough, Queensland, Australia, in an attempt to locate deposits of coking coal for exporting to Japan. The company has taken out prospecting permits over three areas, and established a base on the western side of the island. The Howard coal measures are considered to stretch out to Fraser Island, and the company's immediate objective is to drill below the sandy surface to see if quantities of suitable coal were present in sufficient quantities to warrant exploitation. The chairman of directors, Mr. W. L. Haenke has described the venture as a "long shot", but if coal is present, it could be loaded straight into ships without incurring rail costs, which would make shipping overseas economical. Drilling operations are expected to take several months.

Chinese Coal Mining.—The Fushun Colliery, one of the biggest in Mainland China, is deepening all its shafts by another 100 metres to raise production capacity.

Coal Mines in Sumatra.—Indonesia has signed an agreement with Poland, covering the survey and rehabilitation work on the Umbilian coal mines in Sumatra.

Liberian Iron Ore for U.K.—The first 15,000 tons of iron ore from Liberia's new mines near the Sierra Leone border have been loaded on to a British vessel for delivery to Liverpool. The mines in question are the second group in the region to be brought into operation by the National Iron Ore Co. Shipments from Monrovia are expected to reach about 3,000,000 tons in the first year.

Brazilianization.—A report from Brazil states that it is the intention of the Minister of Mining and Energy to withhold authorization for any future mining project if the capital is less than 51 per cent Brazilian.

Chilean Iron Ore Project.—The Bethlehem-Chile Iron Mines Co., a subsidiary of Bethlehem Steel, has submitted a $9,000,000 expansion plan to the Chilean authorities to raise production at its El Tofo and Romeral iron ore mines. The plan envisages the construction of a new concentrating plant, as well as new equipment to increase production.

Pumping Problems in South African Mines

MINE drainage is always a difficult problem but in S. Africa the situation is exacerbated by the immense quantity of water involved and the great depth of mining operations. Quite apart from operating some of the wettest mines in the world the Republic also possesses many of the deepest, and these two factors considered together, add up to substantial pumping costs. Currently these mines are pumping a total of some 200,000,000 gallons of water daily, much of this total in conjunction with vertical lifts of several thousand feet. Power costs are very high but apart from choosing the right pump and using it effectively little can be done to reduce this mining charge. Where greater efficiency and economy can be achieved, however, is with the removal of fine abrasive solids before the water passes through the pump. There are a number of different types of settlers in use underground but many perform inefficiently and the resultant wear on pump components is correspondingly greater than it need be. This unnecessarily increases pumping maintenance and replacement charges.

Vertical Flow Settler

As part of a general investigation into the settlement and pumping of mine waters on behalf of the Anglo American Corporation and the General Mining and Finance Corporation, the National Mechanical Engineering Research Institute, in co-operation with the National Institute for Water Research, has been investigating a modified design of vertical-flow settler.

In this settler the inflowing turbid water —to which the necessary flocculating chemicals have previously been added and thoroughly mixed — is introduced tangentially into the outer skirt from where it spirals downwards. At the bottom of the outer skirt, simple guide vanes remove the rotational velocity, so that the water then flows radially downwards and inwards and finally vertically upwards through the centre of the settler.

Establishing a Floc Blanket

The settled (clear) water leaves the top of the settler through V-notch openings into a suitable overflow channel, while the settled sludge is periodically withdrawn from the bottom hopper. Under most conditions of operation a so-called floc blanket is established in the inner cone of the settler, this floc blanket serving in effect like a fine sieve in that most fine particles are removed from the upflowing water.

In a 5 ft. dia. pilot plant investigation, vertical flow rates between 1 and 5 in. min. (30 and 150 gallons per hour per square foot of surface area), and inflow turbidities between 100 and 12,000 parts per million have been successfully handled, in all cases yielding clear water.

Current research is aimed at determining the optimum dimensions of the settler, the most economical rate of flow taking into account the cost of flocculating chemicals, and also at finding out how the design can be modified for non-mining applications such as river water settlement for municipal uses.

Importance of the Flocculant

In addition to effective settler design the choice of flocculant is most important. One flocculant which has achieved considerable success in S. African mines is the chemical Superfloc 16 by Cyanamid. Quite apart from effectively settling out suspended solids and so reducing pump wear and tear, the sludge which has been removed has on occasions yielded significant quantities of valuable minerals.

One S. African mine found that the mere trace of a precious mineral—0.35 parts per 1,000,000—was sufficient to be worth treating the 20,000,000 gallons of water pumped from the workings daily.

Through the use of the flocculant this mine was able to reduce pump overhauls from once every 1,000 hours to once every two years and also show a considerable profit from the gold recovered from the precipitated sludge.

Metals and Minerals

Aluminium Puts the Emphasis on Growth

Once again news on the aluminium front presents a picture of steady expansion of facilities in all parts of the world. These developments are now-a-days on such a broad front that although none of the projects reported below are in themselves major operations they become highly significant in the aggregate.

Japan's Aluminium Plans

Expansion projects currently in progress or planned are expected to raise the primary capacity of the Japanese aluminium industry to nearly three times the present figure by 1965. Japan would then be the fourth largest aluminium producing country in the world, with an output exceeded only by the U.S., Canada and Soviet Russia. The latest estimate by the Ministry of International Trade and Industry places probable production capacity in 1965 at 415,000 tonnes compared with about 163,000 tonnes at the present time. Consumption is expected to reach 300,000 tonnes a year by 1965, leaving 115,000 tonnes of domestically produced metal available for export.

Of the three existing producers, Nippon Light Metal Co. is to increase its capacity from 87,000 to 149,600 tonnes, mainly by the addition of a new 50,000 tonne plant; Showa Denko is installing a new 60,000 tonne plant which will raise its capacity from 44,000 tonnes to 104,000 tonnes; while Sumitomo Chemical Co.'s capacity will be raised from 31,000 tonnes to 76,000 tonnes by the construction of a 45,000 tonne plant. In addition, two newcomers—Mitsubishi Kasei and Yawata Aluminium—will have capacities of 60,000 and 25,000 tonnes respectively. The industry's ambitious expansion plans are supported by various tie-ups with producers in the U.S., Canada and France.

Japanese production is currently running at about 150,000 tonnes a year, compared with 131,000 tonnes in 1960. In August, last year output reached the all-time peak of 13,280 tonnes.

Kaiser and Alcan in the Argentine

Kaiser Aluminium and Chemical Corporation is to invest $28,500,000 to build an aluminium plant in Patagonia. According to the Under Secretary of Economy, Senor Eduardo de la Fuente, the investment, which will be incorporated in the Argentine "Fabrica Argentina de Aluminio SA", has in principle been accepted by the Government.

Fabrica Argentina de Aluminio is expected to site the plant near Puerto Madryn near the Atlantic coast. Production is expected to start around the middle of 1963. The plant—the first of its kind to be established in Argentina—will produce 20,000 tons of aluminium a year which is roughly the country's present consumption rate. It is anticipated this will save the country some $6,000,000 annually—even though imported alumina will have to be used for the time being as raw material.

Plans for the investment of about $11,000,000 to enlarge and modernise its existing aluminium foil and sheet fabricating plant at El Palomar, on the outskirts of Buenos Aires, and to build new sheet rolling facilities at a second site, 50 miles from the Argentine capital, have been announced by Aluminium Limited.

The expansion programme will be undertaken by Aluminium Limited's fully-owned subsidiary, Aluminio Argentina, S.A.C.I. In the first stage of the new programme, the El Palomar operation will be expanded to include a complete sheet mill of 8,000 tons annual capacity, a full scale remelt plant, the modernisation and expansion of the existing foil mill, and a 2,200 tons extrusion press, all to be completed in 1963.

In the second stage of the programme, at the city of Zarate, plans call for the construction of a new plant to house additional sheet-rolling facilities. Their completion will bring Aluminium Limited's total aluminium sheet capacity in Argentina to about 16,000 tons per annum by 1965, the company said.

Alumina from Waste in Ohio

It is reported from Cleveland that North American Coal Corp. is planning to start construction early next year of a plant to produce aluminium oxide from aluminium sulphate. Estimated to cost $1,000,000, this plant will be built as an addition to the new 40,000-ton aluminium sulphate plant scheduled to go into operation in December. At the latter plant aluminium sulphate will be produced from ore previously considered waste in coal mining operations, of which millions of tons are reported to be available. Consumers will include the paper industry and users in the municipal and industrial water-treatment fields.

The aluminium oxide plant is expected to be completed late in 1962. It will produce a low soda alumina for use in the abrasive, ceramic and chemical fields.

It is further reported that aluminium manufacturers are showing an increasing interest in plant sites on the Ohio River owned by North American Coal, with a view to the possible erection of aluminium reduction plants. Such plants would provide additional outlets for North American Coal's alumina, as well as increasing the demand for its bituminous coal.

Several years ago North American Coal embarked on a research programme to produce useful products from materials previously regarded as waste. Research on this project has been conducted jointly with Strategic Materials Corp.

Alcan's Second E.E.C. Extrusion Plant

Aluminium Ltd. report the acquisition of a controlling interest in Aluminium Raeren S.A., a newly established Belgian company which is in the process of constructing an aluminium extrusion plant. It is thought that the plant will be in operation some time next year. Alcan already operates one extrusion plant within the E.E.C. at Chartres in France.

Tailpiece

As we go to Press three further news items are to hand underlining the present dynamic of the aluminium industry. Alcan is shortly to begin construction of an aluminium rolling mill in Nigeria with an initial scheduled capacity of 5,000 tons. Norway and Yugoslavia are consulting over the possibility of the latter producing alumina from indigenous high grade bauxite for processing in Norway. The British Aluminium Co. and Kaiser

LONDON METAL AND ORE PRICES, DECEMBER 7, 1961

METAL PRICES

Aluminium, 99.5%, £186 per ton
Antimony—
English (99%) delivered, 10 cwt. and over £230 per ton
Arsenic, £400 per ton
Bismuth (min. 1 ton lots) 16s. lb. nom.
Cadmium 11s. 6d. lb.
Cerium (99%) net, £18 0s. lb. delivered U. K.
Chromium, Cr. 99% 6s. 11d./7s. 4d. lb.
Cobalt, 12s. lb.
Germanium, 99.99%, Ge. kilo lots 2s. 5d. per gram
Gold, 250s. 1½d.
Iridium, £20/£23 oz. nom.
Lanthanum (98%/99%) 15s. per gram
Magnesium, 2s. 2½d./2s. 3d. lb.
Manganese Metal (96%/98%) £275/£285
Nickel, 99.5% (home trade) £660 per ton
Osmium, £17/£22 oz nom.
Osmiridium, nom.
Palladium, Imported, £8 12s. 6d.
Platinum U.K. and Empire Refined £30 5s.
Imported £27 7s. 6d./£27 17s. 6d.
Quicksilver, £59 ex-warehouse
Rhodium, £43/£45 oz.
Ruthenium, £14/£16 oz. nom.
Selenium. 41s. 0d. per lb.
Silver, 85¼d. f. oz. spot and 86¼d. f'd.
Tellurium, 37s. 6d. lb.

ORES AND OXIDES

Antimony Ore (60%) basis		28s. 0d./30s. 0d. per unit c.i.f.
Beryl (min. 10 per cent BeO)		270s./275s. per l. ton unit BeO
Bismuth		30% 5s. 0d. lb. c.i.f.
		20% 3s. 3d. lb. c.i.f.
Chrome Ore—		
Rhodesian Metallurgical (semifriable 48%)	(Ratio 3 : 1)	£15 5s. 0d. per ton c.i.f.
„ Hard Lumpy 45%	(Ratio 3 : 1)	£15 10s. 0d. per ton c.i.f.
„ Refractory 40%		£11 0s. 0d. per ton c.i.f.
„ Smalls 44%	(Ratio 3 : 1)	£13 5s. 0d. per ton c.i.f.
Pakistan 48%	(Ratio 3 : 1)	£11 15s. 0d. per ton f.o.b.
Columbite. Nigerian quality, basis 70% combined pentoxides (Ratio 10:1)		
	$Nb_2O_5 : Ta_2O_5$	150s./160s. 0d. per l. ton c.i.f. nom.
Lithium Ore—		
Petalite min. 3½% Li_2O		50s. 0d./55s. 0d. per unit f.o.b. Beira
Lepidolite min. 3½% Li_2O		76s. 0d./80s. 0d. per unit f.o.b. Beira
Amblygonite basis 7% Li_2O		75s. 0d./85s. 0d. per ton f.o.b. Beira
Magnesite, ground calcined		£28 0s./£30 0s. d/d
Magnesite Raw (ground)		£21 0s./£23 0s. d/d
Manganese Ore Indian—		
Europe (46%-48%) basis 60s. 0d freight		73d./75d. c.i.f. nom.
Manganese Ore (43%-45%)		69d./71d. c.i.f. nom.
Manganese Ore (38%-40%)		nom.
Molybdenite (85%) basis		10s. 0d per lb. (f.o.b.)
Titanium Ore—		
Rutile Australian 95/97% TiO_2 (prompt delivery)		£30/£30 10s. per ton c.i.f.
Ilmenite Malayan 50/52% TiO_2		£11 10s. per ton c.i.f.
Ilmenite Travancore 58/60% TiO_2		£15/£15 10s. per ton c.i.f.
Wolfram and Scheelite (65%)		89s. 0d./92s. 0d. per unit c.i.f.
Vanadium—		
Fused oxide 95% V_2O_5		7s. 6d./8s. per lb. V_2O_5 c.i.f.
Zircon Sand (Australian) 66-67% ZrO_2		£16/£16 10s. ton c.i.f.

Aluminium announce the successful joint development of a modified type of aluminium reduction cell utilizing refractory hard metals as cathodes. The two companies believe the new process will not only reduce substantially aluminium production costs, perhaps by much as 15 per cent, but will also permit expansion of existing facilities with relatively small capital expenditure.

NORWEGIAN ILMENITE

Tests of Norwegian ilmenite are being carried out on an industrial scale by the Quebec Iron and Titanium Corporation at Sorel, near Montreal, to study the suitability of this ore for treatment by a process similar to that used by Q.I.T. to produce Sorel slag, which has proved an acceptable material to U.S. titanium pigment manufacturers. If the results of the tests are satisfactory, A/S Titania, the Norwegian subsidiary of the National Lead Co., will proceed with the construction of a £12,500,000 ilmenite smelter in the Jossingfjord district of Norway, where the company has extensive deposits of ilmenite ore. The smelter will take three years to construct and will be capable of treating 600,000 tons of ore a year to produce some 350,000 tons of concentrate containing 70 per cent titanium dioxide, together with about 150,000 tons of high grade iron concentrate. The proposed method has already been tested on a pilot plant scale at Titania's existing plant. Hitherto the Norwegian ore has been concentrated by magnetic flotation to yield a concentrate containing 44 per cent titanium dioxide and 35 per cent iron. Consumers are reported to have shown a preference for a richer concentrate.

HEAVY TINPLATE CHEAPER

A reduction of £10 a ton in the price of heavy gauge tinplate has been achieved by the Steel Co. of Wales. Technical developments have enabled the company to use the electrolytic process for thicknesses of up to 0.0237 in., in place of the hot-dip process which hitherto has normally been employed for the heavier gauges. This has enabled S.C.O.W. to offer 0.0237 in. gauge tinplate at about £57 a ton compared with the former price of £67.

Copper · Tin · Lead · Zinc

(From Our London Metal Exchange Correspondent)

Stocks in L.M.E. official warehouses at the beginning of the week are reported higher in the case of copper and zinc and lower in the case of tin and lead. With the exception of the news from Katanga and of Indonesian sales of tin to the Eastern *bloc*, there has been little to influence markets one way or the other. In the short term at any rate, the U.K. Government's restrictive policy would seem to make the outlook none too good.

COPPER STEADY ON MIXED NEWS

Copper stocks in L.M.E. official warehouses rose by 275 tons to 15,850 tons. On the L.M.E., prices kept steady until the middle of the week when they advanced by about £1 due to increased buying on news of fighting in Katanga and rather better news from the U.S., where the vice-president of Asarco is reported as having expressed the view that the outlook has improved. However, as he also expressed the opinion that the U.S. is now almost self-sufficient in copper his statement can hardly be regarded as bullish. The contango remains steady at about 5s.

In Santiago the Mines Ministry has announced that a Soviet delegation has arrived to sign a contract for the purchase of 300,000 tonnes of Chilean copper in bars and electro wire, the contract to run for a period of 5 years. Santiago also reports that a new stoppage is threatened at Potrerillos as a result of the lay-off of some labour. Chile's output of copper in all forms in October is reported at 53,343 tonnes, making the monthly average for the 10 months of this year 43,335 tons, about 1,000 tonnes less than the monthly average for the whole of 1960.

West German production of refined copper from smelters and from scrap and crude copper during October was 25,508 tons compared with 26,115 tons in September. Output of electrolytic copper in Japan for the month of October was 24,470 tonnes compared with 23,691 tonnes in September. Copper sales by ENAMI for the account of small Chilean producers during the past week totalled 815 tons. In Brussels the Union Minière du Haute Katanga expects to record copper output of about 300,000 tons for 1961, which is about the same as last year. Independence for the Congo has in fact lost the company only a few days' production.

INDONESIAN TIN FOR RUSSIA

Tin stocks in L.M.E. official warehouses fell by 23 tons to 4,252 tons. On the L.M.E. both price and contango have fluctuated by a few pounds throughout the week, the latter now being £10-£11. In general it is felt that at any rate for the time being, supplies are fully sufficient to meet demand. Yet taking a longer view the outlook appears bullish, subject always to the possibility of action being taken regarding releases from the U.S. strategic stockpile. However, in considering such a possibility it must not be overlooked that the original application for release was made in very different conditions than those ruling today. As things are now, any release would undoubtedly depress prices which would be quite contrary to clearly expressed American policy.

From Djakarta the Government Tin Corporation reports that Indonesia is to ship tin to Russia as part of a plan to increase trade with the Eastern *bloc*. The corporation confirms London reports that 200 tons has already been sold to Russia and states that between 500 and 2,000 tons will follow next year, also that another 1,000 tons will be shipped to another unspecified Eastern European country. In some quarters it is felt that Indonesia may have difficulty in fulfilling this and other commitments as her production is much smaller than it was. Other opinion is that the Indonesian move will mean there will be no Russian tin available for the London market next year.

Shipments of tin from Penang in November totalled 6,789 tons compared with 4,653 tons in October, nearly half the November quota going to the U.S. Shipments from Singapore negligible.

On Thursday the Eastern price was equivalent to £967½ per ton c.i.f. Europe.

LEAD LOWER

Lead stocks in L.M.E. official warehouses fell by 434 tons to 10,994 tons. On the L.M.E. prices have fallen by about £1, during the week, and would now seem to reflect the position as it is today rather more accurately than the higher prices touched in November. The contango has fluctuated only slightly during the week and is now about 25s.

Reports elsewhere of a suspension of Russian shipments seem to have been without foundation, as it is known that the Russians have in fact made offers for 1962 delivery. Output of lead in Japan for the month of October has been given as 7,375 tonnes compared with 7,670 tonnes in September.

ZINC DEMAND GOOD OUTSIDE U.K.

Zinc stocks in L.M.E. official warehouses rose by 119 tons to 11,211 tons. On the L.M.E. prices have fallen during the week by about 30s. due in the main to lack of U.K. demand which seems to indicate that the earlier rise in price was rather overdone. Nevertheless, both in America and on the Continent demand is quite good. The contango on this metal keeps steady at about 25s.

The Bureau of Mines has, announced that consumption of slab zinc in the U.S. in September declined to 80,300 s.tons from the August total of 81,172 tons (revised) but the September figure is well above the 1961 monthly rate. Output of zinc in Japan for the month of October is reported as 19,297 tonnes compared with 18,305 tonnes in September. The Government of India is to allow established importers to import unwrought zinc from any currency area; hitherto quota licences have been valid only for imports from the U.S.

*

U.K. consumption of zinc in the first nine months of this year was 19,449 tons less than in the corresponding period of 1960, not 194,449 tons, as reported in our note in this section on November 17.

OFFICIAL TURNOVERS

Official turnovers (in l.tons) for the week ending December 1, 1961, with the previous week's figures in parentheses, are :—

Copper	...	13,425	(10,425)
Tin	...	1,960	(2,810)
Lead	...	8,550	(11,825)
Zinc	...	12,925	(8,500)

Closing prices are as follow :

	November 30		December 7	
	Buyers	*Sellers*	*Buyers*	*Sellers*
COPPER				
Cash	£228	£228½	£229½	£230
Three months	£228	£228½	£230	£230½
Settlement	£228½		£230	
LEAD				
Current ½ month	£60	£60½	£60½	£60½
Three months	£60½	£61	£61½	£61½
TIN				
Cash	£949	£950	£952	£953
Three months	£960	£961	£962	£963
Settlement	£950		£953	
ZINC				
Current ½ month	£70½	£70½	£70½	£70½
Three months	£71½	£71½	£71½	£71½

Mining Finance

The Prospects For African Industry

The investments of Johannesburg Consolidated are spread throughout Africa in the geographical sense, but their interests lie in areas which have widely differing types of government. To the north there are the investments in diamond companies which are associated with the De Beers group and operate in the wholly African-governed states. In Central Africa, Johnnies have substantial interests in the Rhodesian copper producing companies which operate in a political climate of developing racial partnership and in the Republic of South Africa, where the government policy is one of separate development, the company has further diamond interests together with large investments in platinum, gold and coal.

The operating results of Johnnies for the year ended June 30, 1961, were discussed in these columns on October 27; Mr. D. A. B. Watson, the Deputy Chairman, has now given an outline of the general prospects for the current year and the more distant future in his annual speech.

Although it seems quite possible that there will be short interruptions to normal industrial activity, due perhaps to various and widely differing political causes, Mr. Watson is confident that production and business in all the various African territories, in which Johnnies interests lie, will continue on a satisfactory scale. Perhaps the greatest fears might be with regard to those States which have recently gained independence, but it seems probable that the actions of these States will be guided by the hard facts of economic necessity and thus the industry of those areas should advance uninterrupted. As a result of current sentiment the market value of these African investments may well vary considerably but Mr. Watson does not anticipate any abrupt or wholesale decline in the earning power nor in any sudden changes in fiscal policy in these African territories which would affect the availability of the profits for distribution.

Whilst the market value of a particular investment is relatively unimportant to an investor who is holding the share for earnings, as is essentially the case with the South African mining finance houses, poor market values are a reflection of a lack of investor confidence and this is affecting the South African scene, in particular, at present. Under these conditions the inflow of new capital for direct investment for the South African mines is not forthcoming and more and more the finance houses are being forced to meet these requirements from their own resources. Johannesburg Consolidated is no exception and this trend may well mean a slowing down in the rate at which new projects can be undertaken.

With the new Western Areas mine Johnnies are already well committed and it is not surprising therefore, that in order to conserve funds it is now the company's policy to be increasingly selective in its attitude to prospecting. This is obviously an unfortunate situation for prospecting is the life-blood of a successful mining finance house. However, at present the company has an active prospecting programme which covers four main areas. These areas are to the north of the Kinross area, west of Klerksdorp, in the Kroonstad area and in the vicinity of the Western Areas mine.

In his speech extracts from which are published on page 620, Mr. Watson has drawn attention to the uncertainty which exists over the Double Taxation Relief. It has been generally assumed that an agreement will be introduced giving relief similar to that under existing provisions for "unilateral relief", as this would be in the interests of both countries. However, neither government has yet made any statement on this subject and this is a further contributory factor in the lack of investor confidence. It is essential, that not only should these matters be dealt with quickly but also, that the decisions should be made public as soon as possible.

CASTS—A REMARKABLE YEAR

Almost regardless of which particular facet of Casts' operations one considers, the year ended June 30, 1961 was a remarkable one. The consolidated profit before taxation has increased by some 40 per cent to £4,767,000, the net current assets, excluding stores, have jumped from £1,241,000 to £3,923,000, and in both Ghana and Sierra Leone the output per manshift has increased by almost 13 per cent.

The increase in profit for the year was due in part to the better prices obtained for diamonds sold and in part to the non-recurring adjustments due to the termination of the contracts with the Central Selling Organization. A further element was the surplus on the sale of diamonds included in the previous year's stcoks at directors' valuation.

Although it is not possible from the accounts to assess the value of the non-recurring income there seems little doubt that even without these items the increase in profits would have been substantial. The diamond production in both countries, particularly in Ghana has increased, costs levels have been maintained despite the increase in wages, and better prices have been obtained for the diamonds sold. These are all factors which augur well for the future.

Dividends for the year totalling 3s. have been declared which represents an increase of 8d. per share on the increased capital. This increase does not, in fact, represent the full increase in the company's profits and it may well be assumed that the increase that has been made reflects the actual increase in operating profits. If this is so then there should be no fear that the current year's payment will be at a reduced level. Indeed with a continued increase in production from the new plants in Ghana a further small dividend increase is perhaps more likely. At present the shares yield almost 19 per cent gross.

A SPECIAL PAYMENT BY SAN FRANCISCO

In his statement at the extraordinary general meeting last August, Mr. MacWilliam, the chairman of San Francisco, said that subject to the Mexicanisation deal going through the company hoped it would be possible to make some distribution before the end of 1961.

In fact, the Mexicanisation deal is as yet uncompleted. San Francisco has, to the best of its knowledge, satisfied all the relevant legislation but as yet the Regulations defining the details of what a company must do to qualify have not been published by the Mexican government. This means

London Market Highlights

The previous revival of interest in South African gold shares petered out this week and although there was no selling of any consequence prices soon drifted to lower levels. Hopes that the news of a one-half per cent reduction to 4½ per cent in South Africa's Bank Rate would stimulate a little market interest faded as Wednesday's dealings followed the previously drifting trend. Finance issues came back as the recent demand fell away and Gold Fields reacted 2s. to 68s. after having touched a new high for the year. Consideration of the strong asset position lifted " Johnnies " 1s. to 54s. 6d. on Monday but the shares later drifted back to 53s. despite the generally encouraging meeting in Johannesburg.

The mines themselves tended to lose a few pence each day, although the undertone was still thought to be basically sound. A firm exception was St. Helena which jumped 1s. 10½d. to 70s. 7½d. following the sharply increased profit for last month. Venterspost also encountered some inquiry and gained 1s. to 24s. On the other hand, Free State Geduld, which had been a good market at 101s. 3d. on the previous Friday, softened to 99s. 4½d. and Harmony eased to 91s. After the earlier setback of 2s. 6d. to 7s., Loraine rallied for a while to 18s. 6d. following the denial of Cape rumours of adverse developments at the mine. The denial was supported by the subsequent appearance of an increased working profit for November, but the shares fell away again to 17s. 9d. in part on market speculation as to the likelihood of further fund raising plans being in the offing.

In the diamond section De Beers moved up 3s. 9d. in response to the news that the Soviet diamond sales agreement has been renewed for an " extended period ". " Casts " improved to 16s. in anticipation of the pending annual report. The appearance of that document was followed by a reaction in the shares to 15s. 7½d.; despite the extremely strong asset position shown in the balance sheet, the rise in net liquid assets was not quite up to some recently popular estimates.

Inevitably, the heavy fighting in Katanga depressed the copper share market. Losses, however, were not particularly severe since most holders now seem to be prepared to see things through after the heavy fall in share values which has already taken place. Chartered suffered most with a fall of 2s. 6d. to 61s. 6d. " Tanks " with their important Union Minière interest came back 1s. to 15s. 9d. and similar losses were recorded in Nchanga at 46s. 3d. and Rhodesian Anglo American at 56s. 3d.

Tins were a very uncertain market. Business was at a low ebb and prices quickly responded to each change of the market's mood. Firmness on Monday evaporated on Tuesday and then a better tone developed again on Wednesday when a little Singapore buying appeared. The net result was that prices were not greatly altered on balance. Tanjong, however, were notably firm with a rise of 1s. 3d. to 25s. 3d. on yield considerations. Elsewhere, the excitement in silver issues died down but prices were mostly maintained apart from Fresnillo, which reacted 3s. 9d. to 51s. 3d.

that although the company completed the requirements before September 1 it has not been able to complete the transaction. Although Mr. MacWilliam has stated that " it is understood that it will not now be long before the relevant regulations are published " it is still not certain that the company will gain the tax rebates as at January 1, 1962.

Although the Mexicanisation of 'Frisco has not been completed the board has been able to dispose of some of its refined lead stocks. Due to the new smelting arrangements it is no longer necessary to finance additional metal stocks and the sales have led to a modest cash surplus. The board has therefore declared a special dividend, out of undistributed profits, of 2s. 0d. per stock unit, less income tax. This distribution is independent of the excess undistributed profits that may arise as a result of Mexicanisation Whether the board will be able to recommend a further payment in the new year will depend upon the progress that is made with regard to Mexicanisation in the meanwhile.

NORTH KALGURLI PAY LIMIT MAINTAINED

There are few gold shares which are available to the British investor which do not either suffer from the political problems of Africa or alternatively operate on a subsidy basis. North Kalgurli (1912), however, falls into this category and the results for the year ending March 28, 1961, are very satisfactory in the sense that there has been no rise in operating costs and the pay limit has again been maintained at 4 dwts. per ton.

The total tonnage treated and the gold recovered during the past year were at slightly increased levels compared with the previous period. Gross mining income was £A1,105,706; mining costs, including sundries and depreciation, amounted to £A944,826 leaving a net profit of £A160,880. Dividends for the year totalling 10½d. (Aust.) per share, absorbed £A154,375.

Although the development in the Croesus section has been disappointing the development overall has been satisfactory. Some 3,862 feet were developed in payable ore at an average value of 6.52 dwts. The ore reserves remain substantially unchanged.

In his annual statement, Mr. H. A. Kemlo has given details of the new power station that the company has decided to construct. It had originally been hoped that it would be possible to arrange for the modernization of the Kalgoorlie Power Corporation's plant but the negotiations came to nothing. Orders for the plant and switchgear have been placed with Hawker Siddeley Brush and General Electric respectively and it is anticipated that the equipment will be on site by June 1962 and the plant should be commissioned before the end of that year. The total cost of the project will be in the order of £A275,000 but it is anticipated that there will be a substantial saving in power costs. No indication of the present power charge is given in the report but it probably represents between 10 and 15 per cent of the total working costs.

CHRISTMAS DIVIDEND SEASON

The December South African dividend season has opened with no surprises, though Anglo-Transvaal have adopted a new policy of declaring an interim dividend. Previously a single dividend has been paid and for the past two years this has been at the rate of 30c. per share; the interim which has now been declared is 10c. per 50c. share. The set back officially forecast for Middle Wits has been confirmed with a payment of 4c. compared with the previous 12½c. and at Consolidated Murchison a cut of 2½c. to 40c. follows the 5c. cut in the interim payment.

	June, 1960	*Dec.*, 1960	*June*, 1961	*Dec.*, 1961
Buffels.	18.75c.	17.5c.	17.5c.	17.5c.
Cons. Murchison	35c.	42.5c.	30c.	40c.
E. Rand Ex.	7.5c.	10c.	7.5c.	10c.
Hartebeest.	30c.	25c.	25c.	25c.
Middle Wits.	6.25c.	6.25c.	—	4c.
New Klerksdorp	12.5c.	15c.	35c.	—
New Pioneer	12.5c.	17.5c.	12.5c.	17.5c.
South Roodepoort	11.25c.	11.25c.	11.25c.	11.25c.
Stilfontein	15c.	15c.	15c.	15c.
W. Rand Con.	20c.	22.5c.	17.5c.	15c.

In the General Mining group there has been a sharp cut-back in the payment by West Rand Consolidated following the reduced earnings from the revised uranium arrangements. The last four dividend payments by the companies of both the General Mining and Anglo Vaal groups are given above.

A NEW LOAN BY PENARROYA, S.A.

The French mining company which owns lead-zinc mines in France, Morocco and Spain and copper mines in Chile is to issue a 5 per cent loan of 40,000,000NF (£2,900,000) at a rate of 99½ per cent. The loan covers a period of 20 years, the repayment being at a rate of 110 per cent for the first ten years and 117½ per cent for the second ten years.

BOREHOLE RESULTS AT SAN DOMINGOS

Mason and Barry Ltd. have announced that a borehole near their San Domingos mine has struck pyrites at a depth of 400 feet. The solid pyrites has a width of 11 feet and has a very satisfactory copper and sulphur content. At present there is no indication of the extent of the ore but other holes are being drilled in the vicinity.

CORONATION SYNDICATE

The consolidated net profit for the year ended June 30, 1961, was R369,459, after charging depreciation, as compared with R385,542 for 1959/60. Dividends for the year total 6c. (5.83c. in 1959/60) and absorb R193,200, the provision for taxation is R103,987.

During the past year Coronation Syndicate accepted an offer from Natal Ammonium Collieries (1946) for the purchase of the whole share capital of its subsidiary Riverside Anthracite Colliery; the settlement was by way of shares in Natal Ammonium and these now form part of Coronation's investment portfolio.

The two main interests remain in the wholly owned subsidiaries, Arcturus Mines Limited and the Homestake Gold Mining Company. The former operates the Arcturus mine whilst the latter operates the Muriel Mine on tribute from Coronation Syndicate. During the past year the working results of the two mines have remained satisfactory. As a result of increased grade the Arcturus mine has increased its profitability per ton whilst at the Muriel mine a similar increase has almost maintained the profitability despite an increase in working costs. The improvement at Muriel is also due, in part, to an improvement in recovery, the residue having been improved from 1.10 to 0.86 dwts. per ton. In his annual review, extracts from which are published on page 620, the chairman, Mr. S. F. Dench, has said that recently intensive tests have been conducted on the present method of concentrates treatment and recent results indicate that a possible improvement can be obtained by further concentrates treatment at the mine. A decision on the advisability of providing the necessary additional plant will be made during the current year and although this will require additional capital expenditure it will be moderate by comparison with the anticipated returns.

On the current London price of 3s. 7d. Coronations yield 15 per cent gross. With full D.T.R. (i.e. on an effective rate of 7s. 6d. in the £) the yield is 22 per cent.

RUSSIAN DIAMONDS

The sale of Russian gemstones to the West is to continue to operate through the Diamond Corporation. The agreement whereby these diamonds are marketed through the Central Selling Organization of the De Beers group has been renewed as from next month. In the past the agreements have run for one year only but it has been announced that this latest agreement is for an extended period though no actual duration has been given.

This is certainly indicative that the Russians are very satisfied with the arrangements and may also point to a desire on their part to have a firm market for increased future sales. Although Mr. Oppenheimer has referred to the purchases of Russian diamonds as " substantial " no figures have been disclosed but many experts believe that the volume of trade is increasing and certainly the announcements of new diamond discoveries in the Soviet Union over the past few years would indicate a general growth in diamond mining there. In all some 11 major deposits have been reported in Central Siberia over the past six years.

No indication has been given as to the nature of these deposits, whether they are essentially gem deposits or boart, but it is interesting to note that according to the Soviet Union's trade figures the country is a net importer of industrial diamonds and boart.

TONGKAH'S SEA LEASES

Of the relatively small area that has so far been tested in Tongkah Harbour's sea leases it has been possible to block out ore reserves that will give an operating life of about three years. The average value of the ground is estimated to be 2.13 lb. of tin concentrate per cubic yard. This information is given in the report and accounts published this week.

During the past year the operations of the sea dredge have resulted in the recovery of 1,568 tons. The average re-

covery value was 2.02 lb. per cubic yard and the working costs were 24.27 pence per cubic yard. Operations at the Ronpibon dredge resulted in the recovery of 294 tons, the average recovery grade being 0.58 lb. per cubic yard.

The profit for the year amounted to £619,709 compared with £192,713 for the previous year. Dividends have been declared totalling 8s. per share and absorb £300,314; taxation amounted to £234,846.

RIO ALGOM AND PRESTON DIVIDENDS

Rio Algom have announced a dividend of $1.50 (Canadian) per share. This dividend will be paid on December 27 to all shareholders on record as at December 12, 1961.

Preston Mines, which has a substantial holding in Rio Algom, has declared a dividend of $1.00 (Canadian) per share.

RISCO AND JAPAN

The Rhodesian Iron and Steel Co. is reported to be negotiating with the Japanese Kawasaki Steel Corporation over finance for an £11,000,000 programme of expansion at Risco's main works in Southern Rhodesia and at Bukwe where the company controls large deposits of iron ore. In return for finance the Japanese would sign long-term pig iron contracts.

HOLING AT WESTERN DEEPS

The return airway between the No.'s 2 and 3 shafts at Western Deep Levels has been holed through on the 66 level. This should mean considerably improved ventilation conditions underground and as a result the development programme should continue uninterrupted.

The total driving distance between the shafts was some 9,500 feet. The development throughout has been on the twin haulage system and using treble shift working with multi-blasting some good development figures have been achieved. The best footage in any one month was in November when 1,510 feet were developed from the No. 2 shaft end.

MOUNT ISA—A LIFE OF 50 YEARS

In his speech at the annual meeting in Brisbane, the chairman of Mount Isa told shareholders that the estimated life of the mine was more than fifty years even at the increased rates of production. This was based on the present probable ore reserves and the indications are that the diamond drilling to date has not disclosed all the profitable ore in the lease area.

PLACER DEVELOPMENT AND NORANDA

It has been revealed that Noranda has bought a 22½ per cent interest in Placer Development. The interest, represented by some 600,000 shares has been acquired from the International Mining Corporation, a United States company which is retaining a block of 200,000 Placer shares. Noranda was not the only company anxious to purchasing this interest in Placer, it is understood that both Denison Mines and Locana Minerals were interested in the block of shares.

At present Placer derives the major part of its income from its old interests in the two gold dredging companies, Bulolo and Pato Consolidated; its future, however, depends upon its important interests in two of Canada's large new mining projects. Placer has a 45 per cent interest in Craigmont Mines, the rich copper property in B.C. which has recently started production, and a 22 per cent interest in Mattagami Lake Mines. Mattagami is a rich zinc property which is still in the development stage.

Noranda itself has direct interest in both of these projects and therefore it is perhaps not surprising that it was Noranda that ultimately secured the block of shares despite what was probably strong competition.

Placer's important interests outside Canada are coal in Australia and copper in the Philippines.

PHOENIX PRINCE

The Phoenix Prince gold mine in Southern Rhodesia has suspended operations. In June this year the chairman informed shareholders that it might not be possible to continue milling for any length of time at the rate then current. In the past few months tonnage has continued to fall. The installation of a smaller plant is under consideration.

TSUMEB'S SCHEDULES

The annual report of the O'Okiep Copper company states that the Tsumeb Corporation's copper smelter is expected to be in operation by the middle of next year with a capacity of about 20,000 tons of copper per annum. It will treat concentrates from Tsumeb and from the proposed mine at Asis in South-West Africa. The lead smelter and refinery at Tsumeb is scheduled for completion by the end of 1963. These plans form part of a £7,000,000 programme being undertaken by the Tsumeb Corporation, whose major shareholders include Selection Trust, Union Corporation, and American Metal Climax.

DIAMOND SAMPLES FROM THE SEA

Mr. Sam Collins, chairman of one of the three companies engaged in prospecting for diamonds in the sea off the coast of South-West Africa and the Cape Province, announced recently in Cape Town that large-scale diamond mining within the three-mile limit in a bay south of Luderitz would probably begin in about six months, following the discovery there of a deposit of gem stones of very high quality. A sample taken from 4½ tons of soil " air-lifted " from the sea-bed with special equipment was stated to have yielded 45 diamonds with a total weight of nine carats. The companies concerned in the project are the Marine Diamond Corporation of South-West Africa, the General Mining and Finance Corporation, and the Anglo-Transvaal Mining and Finance Corporation. These companies, which plan to spend about £1,000,000 on the exploratory survey for marine diamonds up to the end of next year, have a 384-mile concession stretching from the mouth of the Olifants River, on the Cape Coast, to Luderitz in South-West Africa.

NATIONAL MINING'S PORTFOLIO

The analysis of the company's quoted portfolio as at September 30, 1961, shows that 29 per cent is held in mining. However, this must be regarded as a conservative figure for its investments in Western Selection and Kwahu, which are probably substantial, and its holding in Chartered are now given under the heading of Banks, Insurances and Trusts, which in total represents 23 per cent. Over and above these mining interests there is the unquoted investment in Mines Development Syndicate which holds a lead-zinc property in Eastern Nigeria.

In his annual review the chairman, Mr. C. J. Burns, has outlined the difficulties connected with this lead-zinc project. Although the grade of the ore reserves is high the capital that is required for this kind of project has not been available due to the generally declining investment interest in Africa. However, as a result of the economic development in Nigeria over the past few years it has been possible to reduce considerably the original cost estimates thus improving the profitability of the project, and at present negotiations are in progress to determine the capital structure of the operating company.

Phoenix Copper.—The parent company Granby Mining has announced that the capacity at the Phoenix Copper mine is to be expanded from 1,000 tons per day to 1,500 tons per day. This is to be achieved by the installation of additional grinding and flotation equipment and should be completed by mid-1962.

Southern Kinta.—An interim dividend of 6d. per share, less tax, has been declared with respect to the year ending March 31, 1962.

Temoh Tin. — No dividend has been recommended for the year ended June 30, 1961. The results for the year show a net loss of £3,564.

Board Changes

Consolidated African Selection Trust announce that Sir Edward Asafu-Adjaye has been appointed a director of the company.

Sir Frederick Crawford, has been appointed to the board of Rand Selection Corporation. Sir Frederick who was, until recently, Governor of Uganda, is now resident director in Africa for The British South Africa. Co.

Lydenburg Estates announce that Mr. C. Clore and Mr. W. F. Ewbank have resigned as directors of the company, as from December 5, and that Mr. E. C. Baring and Mr. B. W. Pain have been appointed to the board.

Mr. R .W. Rowland has been appointed a director of Henderson's Transvaal Estate and Tweefontein Investments.

Mr. Arnold Carr, deputy chairman and assistant managing director of Thos. W. Ward Ltd., has been appointed joint managing director of the company.

The Hunting Group of Companies announce that Mr. Lindsay Hunting is to retire from the chairmanship at the end of 1961, for health reasons, but will continue as a Group director. The new chairman will be Mr. C. P. M. Hunting, at present vice-chairman. The new vice-chairman will be Mr. Clive Hunting, eldest son of Mr. Lindsay Hunting.

The election of Dr. Karl L. Fetters as the 1962 president of The Metallurgical Society of AIME has been announced.

JOHANNESBURG CONSOLIDATED INVESTMENT COMPANY LIMITED

(Incorporated in the Republic of South Africa)

EXTRACTS FROM MR. D. A. B. WATSON'S SPEECH

The annual general meeting of Johannesburg Consolidated Investment Company Limited was held in Johannesburg on December 5.

Mr. D. A. B. Watson presided and, in the course of his speech, said : For the year ended June 30, 1961, the profit, before tax, of your company and its wholly-owned subsidiaries, Barnato Brothers Limited and Barnato Holdings Limited, amounted to the record figure of R5,275,150 (£2,637,575), an increase of R138,830 (£69,415) over the comparable figure for the previous year.

There was an improvement of R734,990 (£367,495) in our dividend income, which at R5,776,644 (£2,888,322) was also a record for the company. However, this improvement was accompanied by a reduced profit from the realisation of investments, which at R332,866 (£166,433) was only about one-half of the average annual profit earned by this side of our business during the preceding five years.

There was a substantial net depreciation of R3,084,454 (£1,542,227) in the book value of our portfolio. The total market value of our investments at June 30, 1961, was R54,125,776 (£27,062,888) as compared with R58,136,032 (£29,068,016) at June 30, 1960.

The decline during recent years in the London share prices of our investments in various companies operating in Africa stems not from a general diminution in their current intrinsic earning capacity which, on the contrary, has on the whole been more than maintained.

It results from the continuing anxiety of investors or potential investors in enterprises in Africa as to the effects of Government policies and political changes upon future industrial activity in various parts of that continent, upon the flow of profits arising from that activity, and upon the rate of tax levied on such profits. The political changes have been widespread and rapid. They are not at an end but will continue in various forms for many years.

Financing Enterprise

Having commented on the possible short-term effect on the company's interests of African political development, Mr. Watson continued : We remain of the opinion expressed at our meeting last year, namely that production and business in the various territories in which our interests lie will continue, possibly with some interruptions, but nevertheless on a satisfactory scale. I do not envisage any abrupt or wholesale decline in the earning power of our investments in these territories, nor any such sudden changes in fiscal policies as would significantly affect the quantum of profits available for distribution by the companies concerned.

It would, however, be unrealistic to ignore the fact that investment in Africa carries with it risks. The rewards, in our opinion, are commensurate with those risks, but the fact remains that many potential investors are hesitant at this stage to accept the risks at the rates of reward offered. Because of this lack of confidence, foreign investors have been net sellers of shares in African concerns and, as a result, a strong and persistent movement of funds out of South Africa developed over the past two years.

Under prevailing conditions, it is unlikely that there will be a satisfactory inflow of overseas capital for direct investment in the development of South African mines. The South African Mining Finance Houses may therefore to an increasing extent have to meet these requirements from their own resources.

Capital will be needed in the immediate future and during the next few years for the expansion of the various mines which have recently reached or are about to reach production. The amounts required to bring these mines to their full milling rates will be large and, although a considerable portion of the necessary funds will undoubtedly be found by the Mining Finance Houses themselves, the possible difficulty and cost of raising funds might result in a trend towards a slowing down of the rate at which projects can be expanded or undertaken.

Part of the business of a Mining Finance House such as ours is to seek investment in enterprises in their early stages when the risk is high and the potential rewards correspondingly great. In attempting to find fields for such investment, they have therefore been active in prospecting and have spent considerable sums thereon.

If, as appears possible, South African Mining Finance Houses have to find from their own resources an increased proportion of the capital required for the exploitation of such areas, these institutions may tend to require an even higher expectation of reward than might otherwise have been the case.

In so far as our company is concerned, our attitude towards prospecting may therefore, for the above reasons and because of the necessity to conserve funds, become increasingly selective. Meanwhile, our prospecting for new gold mining areas continues in respect of four main projects which were started last year, one to the north of the new goldfields in the Leslie/Kinross area, one to the west of the Klerksdorp goldfields, one in the Kroonstad area and one in the neighbourhood of the lease area of the Western Areas Gold Mining Company. Our future prospecting programme will be determined in the light of circumstances prevailing from time to time.

Current Year

We estimate that our profit for the current year will be more or less maintained at last year's level. Our present estimate is that last year's rate of dividend should be maintained for the current year. This forecast depends naturally not only upon the maintenance of our presently anticipated dividend income, but also upon there being no further fall in share prices of such magnitude as to necessitate substantial provisions to meet the resultant depreciation in the book value of our investments. In the current year there had up to the end of November been no net depreciation in the book value as at 30th June, 1961.

CORONATION SYNDICATE, LIMITED

(Incorporated in the Republic of South Africa)

CHAIRMAN'S REVIEW

The 56th annual general meeting of Coronation Syndicate, Limited will be held on December 22 in Johannesburg.

The following are extracts from the circulated review of the chairman, **Mr. S. F. Dench, F.C.I.S. :**

The net profit for the year earned by the Group, as reflected in the Consolidated Profit and Loss Account after charging R70,037 for depreciation and after transferring R9,068 to Output Equalization Reserve and R4,550 to Cost Equalization Reserve, was R369,459 as compared with R385,542 for the previous year.

A provision of R103,987 has been made for taxation and a further R12,000 transferred to Stores Reserve. An amount of R50,000 has been appropriated in the year under review for amortization of mining claims and shafts and the balance of R242,000 standing to General Reserve has been transferred to that account bringing the total to R292,000. Dividends, totalling 6 cents per share, accounted for R193,200 an increase of R5,366 over the previous financial year. After taking into account a credit of R9,977 arising from the disposal of shares in a former subsidiary company and adding back the balance of R48,205 brought in from last year there remains an unappropriated balance carried forward of R68,454.

Muriel Mine

The Burnett Shaft was sunk 74 feet to 2,104 feet below surface and is now down to the 21st Level. Primary development accomplished was 7,139 feet as against 7,840 feet for the previous year. The footage sampled was 2,347, of which 1,768 feet (75%) were payable averaging 10.0 dwts. per ton over 49 inches.

The Ore Reserves are computed at 201,960 tons having a value of 10.4 dwts. per ton over a stoping width of 53 inches. Compared with last year, the tonnage is practically unchanged; the width has increased by 3 inches while the average value is lower by 0.1 dwts. per ton.

Arcturus Mine

The No. 2 Internal Incline Shaft was sunk 179 feet to 83 feet below the 20th Level and 132 feet of station cutting was done. Primary development accomplished was 7,960 feet reflecting an increase of 1,319 over the previous year. The footage sampled was 3,975, of which 900 feet (22.6%) were payable averaging 8.1 dwts. per ton over a width of 47 inches.

The Ore Reserves are computed at 321,600 tons having a value of 7.4 dwts. per ton over a stoping width of 59 inches. Compared with last year there is a decrease of 25,850 tons; the average width is higher by one inch, and the value by 0.1 dwts.

Tebekwe Mine

Tribute royalty received during the year amounted to R1,894 as compared with R2,030 for the financial year ended June 30, 1960.